14277

SERVICE INFORMATION

MODEL: CM-1496X CM-1498X
COLOR DISPLAY MONITOR

TATUNG®

CKT NO.	PART NO.	DESCRIPTION	SPEC
		ASSEMBLY,PCB-CRT, PWB-1299B-04	
CAPACITOR			
C501,C531 C561	5213210191	CAPACITOR,ELECTROLYTIC	CE04W 10V 100.00UFM
C502,C532 C562	5231810391	CAPACITOR,CERAMIC CK45	F DC 50V10000.00PFZ
C503,C533 C563	5231810391	CAPACITOR,CERAMIC CK45	F DC 50V10000.00PFZ
C504,C534 C564	5213622991	CAPACTIOR,ELECTROLYTIC	CE04W 50V 2.20UFM
C505,C535 C565,C593	5213447091	CAPACITOR,ELECTROLYTIC	CE04W 25V 47.00UFM
C506,C536 C566,C591	5231810391	CAPACITOR,CERAMIC CK45	F DC 50V10000.00PFZ
C593	5213347091	CAPACITOR,ELECTROLYTIC	CE04W 16V 47.00UFM
C594	5275122401	CAPACITOR,METALLIZED,P.E P=5MM	CF93M 63V 0.22MFJ
C595	5213347991	CAPACITOR,ELECTROLYTIC	CE04W 16V 4.70UFM
C596	5213433112	CAPACITOR,ELECTROLYTIC	CE04W 25V 330.00UFM
C901	5247022191	CAPACITOR,CERAMIC CC45	SL DC 50V 220.00PFJ
C902,C932 C962	5214247991	CAPACITOR,ELECTROLYTIC	CE04W 160V 4.70UFM
C903,C933 C963	5270302501	CAPACITOR,METALLIZED P.P P=15	CF93T 250V 0.22MFJ
C931,C961	5247015191	CAPACITOR,CERAMIC CC45	SL DC 50V 150.00PFJ
C991	5233310201	CAPACITOR,CERAMIC CK45	B DC 1KV 1000.00PFK
C992	5234333101	CAPACITOR,CERAMIC CK45	B DC 2KV 330.00PFK
C993	5214410012	CAPACITOR,ELECTROLYTIC	CE04W 250V 10.00UFM
RESISTOR			
R210,R212 R213	5142810295	RESISTOR,CARBON FILM	RD S B 1/4W 1.00KJ
R211	5142820395	RESISTOR,CARBON FILM	RD S B 1/4W 20.00KJ
R214,R215 R216	5142111295	RESISTOR,CARBON FILM	RD S B 1/6W 1.10KJ
R501,R531 R561	5142875095	RESISTOR,CARBON FILM	RD S B 1/4W 75.00 J
R502,R532 R562	5162172210	RESISTOR,VR PN08TB223AR	TM5X5 B 22.00KOHM
R503,R533 R563	5142862295	RESISTOR,CARBON FILM	RD S B 1/4W 6.20KJ
R505,R535 R565	5142882395	RESISTOR,CARBON FILM	RD S B 1/4W 82.00KJ
R585	5142827295	RESISTOR,CARBON FILM	RD S B 1/4W 2.7K J
R586,R599	5142851295	RESISTOR,CARBON FILM	RD S B 1/4W 5.10KJ
R587	5142813395	RESISTOR,CARBON FILM	RD S B 1/4W 13.00KJ
R588	5142891195	RESISTOR,CARBON FILM	RD S B 1/4W 910.00 J
R589	5142813295	RESISTOR,CARBON FILM	RD S B 1/4W 1.30KJ
R594	5142822395	RESISTOR,CARBON FILM	RD S B 1/4W 22.00KJ
R595	5142810195	RESISTOR,CARBON FILM	RD S B 1/4W 100.00 J
R596	5142810395	RESISTOR,CARBON FILM	RD S B 1/4W 10.00KJ
R597	5142847395	RESISTOR,CARBON FILM	RD S B 1/4W 47.00KJ
R598	5142830295	RESISTOR,CARBON FILM	RD S B 1/4W 3.00KJ
R901,R931	5142882095	RESISTOR,CARBON FILM	RD S B 1/4W 82.00 J

CKT NO.	PART NO.	DESCRIPTION	SPEC
R961			
R902,R932	5142833095	RESISTOR,CARBON FILM	RD S B 1/4W 33.00 J
R962			
R903,R933	5142868195	RESISTOR,CARBON FILM	RD S B 1/4W 680.00 J
R963			
R904,R934	5142847195	RESISTOR,CARBON FILM	RD S B 1/4W 470.00 J
R964			
R905,R935	5111210190	RESISTOR,CARBON COMPOSITION	RC GE 1/2W 100.00 J
R965			
R906,R936	5130715200	RESISTOR,METAL OXIDE FILM,MINI	RS 08 B 5W 1.50KJ
R966			
R907,R937	5142822195	RESISTOR,CARBON FILM	RD S B 1/4W 220.00 J
R967			
R908,R938	5130310307	RESISTOR,METAL OXIDE FILM,MINI	RS 08 B 1W 10.00KJ
R968			
R909,R939	5142810195	RESISTOR,CARBON FILM	RD S B 1/4W 100.00 J
R969			
R910,R940	5162171910	RESISTOR,VR PN08TB103AR	TM5X5 B 10.00KOHM M
R970			
R911,R941	5142843195	RESISTOR,CARBON FILM	RD S B 1/4W 430.00 J
R971			
R912,R942	5142843095	RESISTOR,CARBON FILM	RD S B 1/4W 43.00 J
R972			
R991	511123490	RESISTOR,CARBON FILM	1/2W 330OHM
R992	5111233490	RESISTOR,CARBON COMPOSITION	RC GE 1/2W 330.00KJ
MISCELLANEOUS			
S901,S931	5202201991	SPARK GAP MITSUBISHI	DC200V 1PF DSP-201M-C04F
S961,S991			
		ASSEMBLY,PCB-POWER, PWB-1345A	
CAPACITOR			
C803	5215310101	CAPACITOR,ELECTROLYTIC (105C)	CE04W 16V 100.00MFM
C804	5215347101	CAPACITOR,ELECTROLYTIC (105C)	CE04W 16V 470.00MFM
C805,C820	5215310101	CAPACITOR,ELECTROLYTIC (105C)	CE04W 16V 100.00MFM
C806	5247047191	CAPACITOR,CERAMIC CC45	SL DC 50V 470.00PFJ
C807	5231322291	CAPACITOR,CERAMIC CK45	B DC 50V 2200.00PFK
C808	5221182291	CAPACITOR,POLYESTER	CQ93M 50V 8200.00PFJ
C810	5271115401	CAPACITOR,METALLIZED P.E P=10	CF93M 100V 0.15MFJ
C811	5272110401	CAPACITOR,METALLIZED P.E P=10	CF93M 250V 0.10MFJ
C813	5221110391	CAPACITOR,POLYESTER	CQ93M 50V10000.00PFJ
C814	5223647301	CAPACITOR,POLYPROPYLENE P=15MM	CQ93T 630V47000.00PFJ
C815	5234310201	CAPACITOR,CERAMIC CK45	B DC 2KV 1000.00PFK
C817,C818	5210308000	CAPACITOR,ELECTROLYTIC (105C)	CEL1W 250V 220.00UFM
C821,C840	5232310291	CAPACITOR,CERAMIC CK45	B DC 500V 1000.00PFK
C845			
C824,C825	5232347201	CAPACITOR,CERAMIC CK45	B DC 500V 4700.00PFK
C831,C835	5232333191	CAPACITOR,CERAMIC CK45	B DC 500V 330.00PFK
C850			
C832	5210403501	CAPACITOR,ELECTROLYTIC	CE04C 35V 1000.00UFM
C836	5215410212	CAPACITOR,ELECTROLYTIC (105C)	CE04W 25V 1000.00MFM
C841	5216210101	CAPACITOR,ELECTROLYTIC (105C)	CE04W 160V 100.00UFM
C843	5214410012	CAPACITOR,ELECTROLYTIC	CE04W 250V 10.00UFM
C846	5216347001	CAPACITOR,ELECTROLYTIC (105C)	CE04W 200V 47.00UFM
C851	5215347101	CAPACITOR,ELECTROLYTIC (105C)	CE04W 16V 470.00MFM

CKT NO.	PART NO.	DESCRIPTION	SPEC
RESISTOR			
R801 RA	5101106800	POWER THERMISTOR	SEMITEC 5D-11 50HM B=3250
R801 RB	5101106201	SURGE-GARD	SG-220
R802	5150107301	RESISTOR,CEMENT (H<40MM)	RW 98 10W 5.00KJST
R803	5101106900	POSISTOR,PTH451C02BG200N270	C 20.00 N 200V MURATA
R804	5142812995	RESISTOR,CARBOW FILM	RD S B 1/4W 1.20 J
R805	5140039490	RESISTOR,CARBON FILM	RD S B 1W 390.00KJ
R806	5142810195	RESISTOR,CARBON FILM	RD S B 1/4W 100.00 J
R807	5142812295	RESISTOR,CARBON FILM	RD S B 1/4W 1.20KJ
R808	5140012490	RESISTOR,CARBON FILM	RD S B 1W 120.00KJ
R810	5140015490	RESISTOR,CARBON FILM	RD S B 1W 150.00KJ
R811	5142827095	RESISTOR,CARBON FILM	RD S B 1/4W 27.00 J
R812,R814 R820	5142882295	RESISTOR,CARBON FILM	RD S B 1/4W 8.20KJ
R813	5162101920	RESISTOR,VR RV08FB103AR	1/4 W B 10 KOHM
R815	5150107302	RESISTOR,CEMENT (H<40MM)	RW 98 10W 45.00KJST
R816	5130410107	RESISTOR,METAL OXIDE FILM,MINI	RS 08 B 2W 100.00 J
R817 RA	5130315404	RESISTOR,METAL OXIDE FILM,MINI	RS 08 B 1W 150.00KJ
R817 RB	5142515401	RESISTOR,CARBON FILM	RD S B 1W 150.00KJ
R818	5142818295	RESISTOR,CARBON FILM	RD S B 1/4W 1.80KJ
R819	5142824195	RESISTOR,CARBON FILM	RD S B 1/4W 240.00 J
R821,R822	5142822495	RESISTOR,CARBON FILM	RD S B 1/4W 220.00KJ
R823	5142801095	RESISTOR,CARBON FILM	RD S B 1/4W 1.00 J
SEMICONDUCTORS			
D801 RA	6611024700	DIODE RECTIFIER BRIDGE	GIT KBL06 400V 4A
D801 RB	6611024701	DIODE RECTIFIER	REC RS405L 600V 4A
D805 RA	6611012741	DIODE RECTIFIER	HIT V19G 600V 0.2A T=52MM
D805 RB	6613002246	DIODE SWITCHING	GIT RGP10J 600V 1A F T=52MM
D806,D807 D808,D811 RA	6613002242	DIODE SWITCHING	HIT V09E 400V 1A F T=52MM
D806,D807 D808,D811 RB	6613002245	DIODE SWITCHING	GIT RGP10G 400V 1A F T=52MM
D810	6611012844	DIODE RECTIFIER	FAG BA159 1000V 1A TAPING 52MM
D812 RA	6611012741	DIODE RECTIFIER	HIT V19G 600V 0.2A T=52MM
D812 RB	6613002246	DIODE SWITCHING	GIT RGP10J 600V 1A F`T=52MM
D820,D821 D824,D826	6611013006	DIODE RECTIFIER	GIT RGP15G 400V 1.5A
D822,D823	6611013043	DIODE RECTIFIER	GIT RGP15J 600V 1.5A T=52MM
D827	6611013006	DIODE RECTIFIER	GIT RGP15G 400V 1.5A
IC801 RA	6644058800	IC LINEAR	SIE TDA4601
IC801 RB	6644058801	IC LINEAR	SGS TDA-4601
Q801	6621030800	TR NPN HF	SYO 2SC3461-L
Q802	6621019101	TR NPN HF	TSB 2SC2482
Q803 RA	6631001800	SCR	CW-12B 100V 0.3A
Q803 RB	6631001731	THYRISTOR SCR	TSB SFOR1B42 (IG1) TAPING
COILS AND TRANSFORMERS			
L801	5061106600	CORE,BEAD INDUCTOR	TOKIN B01-AT1F
L802	5062102400	COIL, CHOKE	TRF-9229
L833,L837 L842,L847	5062217000	COIL,LOSS TSH-170	L=140UH
T801	5061346400	SWITCHING JRANSFORMER	TPW-464,UL/CSA/TUV

CKT NO.	PART NO.	DESCRIPTION	SPEC
		ASSEMBLY,PWB-LINE FILTER, PWB-1428	
CAPACITOR			
C827,C828	5270101501	CAPACITOR,METALLIZED P.EP=27.5	CF99MAC250V 0.47MFM
C829,C830	5230101800	CAPACITOR,CERAMIC CK45 (KC)	F AC 400V 2200.00PFM
RESISTOR			
R826	5142830495	RESISTOR,CARBON FILM	RD S B 1/4W 300.00KJ
COILS AND TRANSFORMERS			
L804	5061102201	LINE FILTER	TLF-011 27MH
MISCELLANEOUS			
F801	5054410501	FUSE FUS-152 UL/CSA	250V 2.5 A TL
POWER CORD			
P807	5097605900	POWER CORD	
		ASSEMBLY,PCB-LED, PWB-1338-002	
RESISTOR			
R756	5145810290	RESISTOR,CARBON FILM	RD U B 1/4W 1.00KJ
MISCELLANEOUS			
G701	6618014200	DIODE LED	SE6322AK/LT2022E-11 GREN 2X5MM
		ASSEMBLY,VERTICAL SIZE CTL, PWB-1627	
CAPACITOR			
C321	5275122491	CAPACITOR,METALLIZED P.E	CF93M 63V 0.22MFJ
C322	5213347991	CAPACITOR,ELECTROLYTIC	CE04W 16V 4.70UFM
RESISTOR			
R344	5130315104	RESISTOR,METAL OXIDE FILM,MINI	RS 08 B 1W 150.00 J
R345	5142816495	RESISTOR,CARBON FILM	RD S B 1/4W 160.00KJ
R346	5142856395	RESISTOR,CARBON FILM	RD S B 1/4W 56.00KJ
R347	5142830395	RESISTOR,CARBON FILM	RD S B 1/4W 30.00KJ
R348	5142822195	RESISTOR,CARBON FILM	RD S B 1/4W 220.00 J
R349	5142815495	RESISTOR,CARBON FILM	RD S B 1/4W 150.00KJ
R350	5142810295	RESISTOR,CARBON FILM	RD S B 1/4W 1.00KJ
R351	5142820295	RESISTOR,CARBON FILM	RD S B 1/4W 2.00KJ
SEMICONDUCTORS			
D311	6615012234	DIODE ZENER	TSB 05AZ5.1Y 4.81V-5.17V T=26MM
D312	6613001730	DIODE SWITCHING	HIT IS2076 30V 150MA T=26MM
Q304	6646007018	IC,DIGITAL	HIT 74LS123P
Q305	6621003230	TR NPN HF	HIT 2SC458-C TAPING

CKT NO.	PART NO.	DESCRIPTION	SPEC
		ASSEMBLY,CONTROL(VR), CM1498X-U01	
RESISTOR			
R444	5160806226	VR,RV16NB503EKER-CC	1/10W B 50.00KOHM
R590	5161161714	RESISTOR,VARIABLE RV16NB502EK	1/5 W B 5 KOHM
MISCELLANEOUS			
S801	5054519600	SWITCH SEE-SAW AC250V TV5	FD SDDTA3007U-TT/ALPS SDDTA3
		ASSEMBLY,SIGNAL CABLE	
P505	5057404226	ASSEM. CABLE	
		ASSEMBLY,CRT, CM1498X-U02	
COILS AND TRANSFORMERS			
L991	5060117901	COIL,DEGAUSSING	TSB-179A R=25 OHM L=320MM
MISCELLANEOUS			
V901 RA	5051224306	CCRT/DY (CM-1496X)	M34JOU30X95
V901 RB	5051225900	CCRT/DY (CM-1496X)	E8034B22-TC13ETHT
V901 RA	5051224304	CCRT/DY (CM-1498X)	M34KFT03XE14
V901 RB	5051224305	CCRT/DY (CM-1498X)	E8032B22-TC100THT

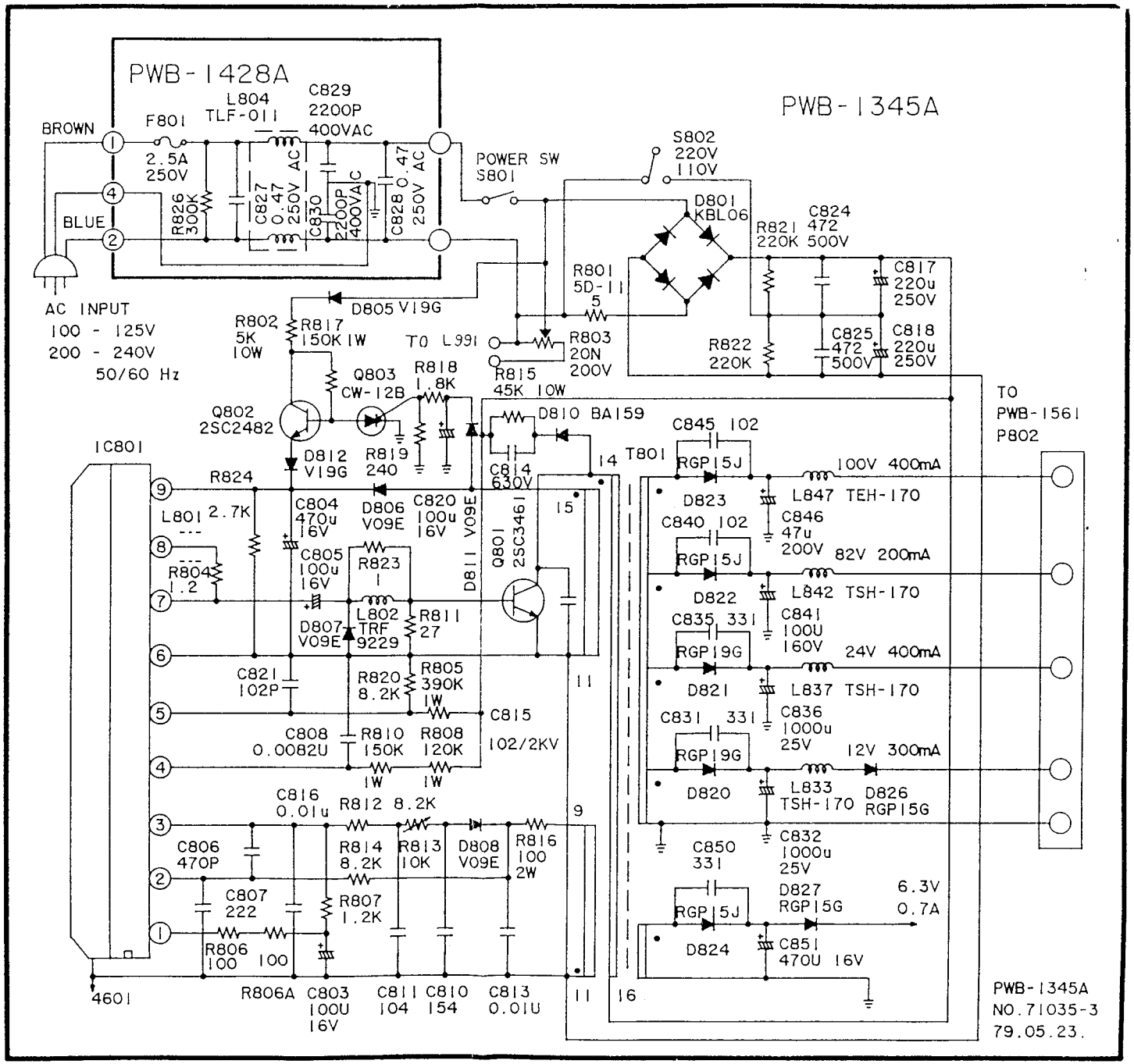

PWB-1428A
PWB-1345A
BROWN
BLUE
F801
2.5A
250V
L804
TLF-011
C829
2200P
400VAC
R826
300K
C827
0.47
250V AC
C830
2200P
400VAC
C828
0.47
250V AC
POWER SW
S801
S802
220V
110V
D801
KBL06
R821
220K
C824
472
500V
C817
220u
250V
C818
220u
250V
C825
472
500V
R822
220K
R801
5D-11
5
R803
20N
200V
R815
45K 10W
TO L991
AC INPUT
100 - 125V
200 - 240V
50/60 Hz
D805 V19G
R802
5K
10W
R817
150K 1W
Q803
CW-12B
R818
1.8K
Q802
2SC2482
D810 BA159
C845 102
RGP15J
100V 400mA
D823
L847 TEH-170
C840 102
RGP15J
C846
47u
200V 82V 200mA
D822
L842 TSH-170
C835 331
RGP19G
C841
100U
160V 24V 400mA
D821
L837 TSH-170
C831 331
RGP19G
C836
1000u
25V 12V 300mA
D820
L833 TSH-170
D826
RGP15G
C850
331
C832
1000u
25V
D827
RGP15J
RGP15G
6.3V
0.7A
D824
C851
470U 16V
TO
PWB-1561
P802
IC801
R824
L801 2.7K
R804
1.2
C804
470u
16V
D806
V09E
C820
100u
16V
D811 V09E
Q801
2SC3461
C814
630V
D812
V19G
R819
240
T801
C805
100u
16V
R823
1
L802
TRF
9229
D807
V09E
R811
27
C821
102P
R820
8.2K
R805
390K
1W
C815
102/2KV
C808
0.0082U
R810
150K
1W
R808
120K
1W
C816
0.01u
R812 8.2K
C806
470P
R814
8.2K
R813
10K
D808
V09E
R816
100
2W
C807
222
R807
1.2K
R806
100
100
4601
R806A
C803
100U
16V
C811
104
C810
154
C813
0.01U
PWB-1345A
NO.71035-3
79.05.23.

Fig 9-2 S.M.P.S CIRCUIT BOARD LAYOUT

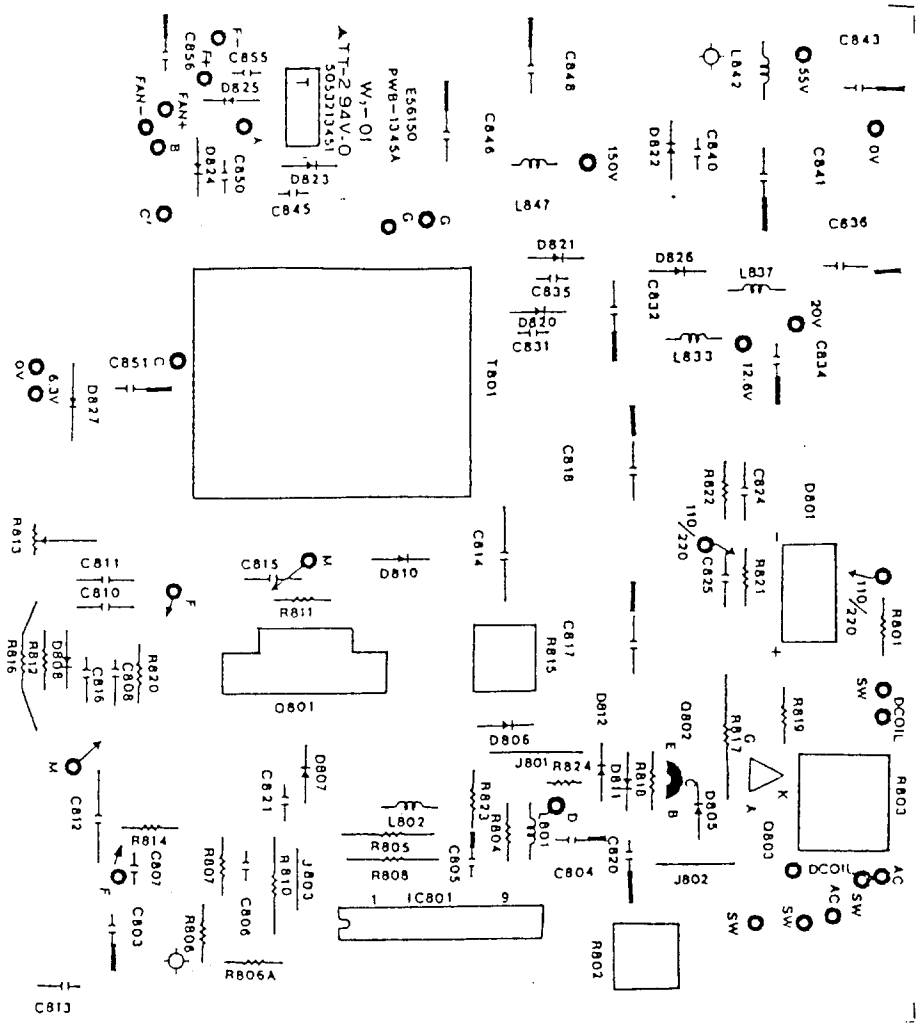


Fig 9-4 LINE FILTER CIRCUIT BOARD LAYOUT

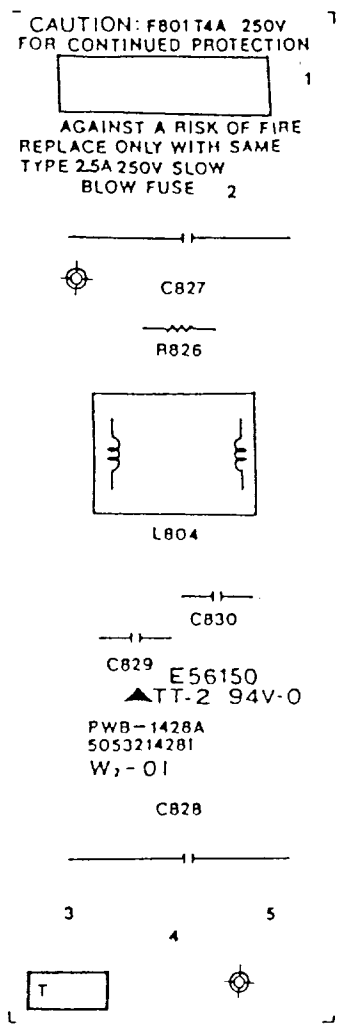


Fig 9-3 CRT DRIVE BOARD LAYOUT

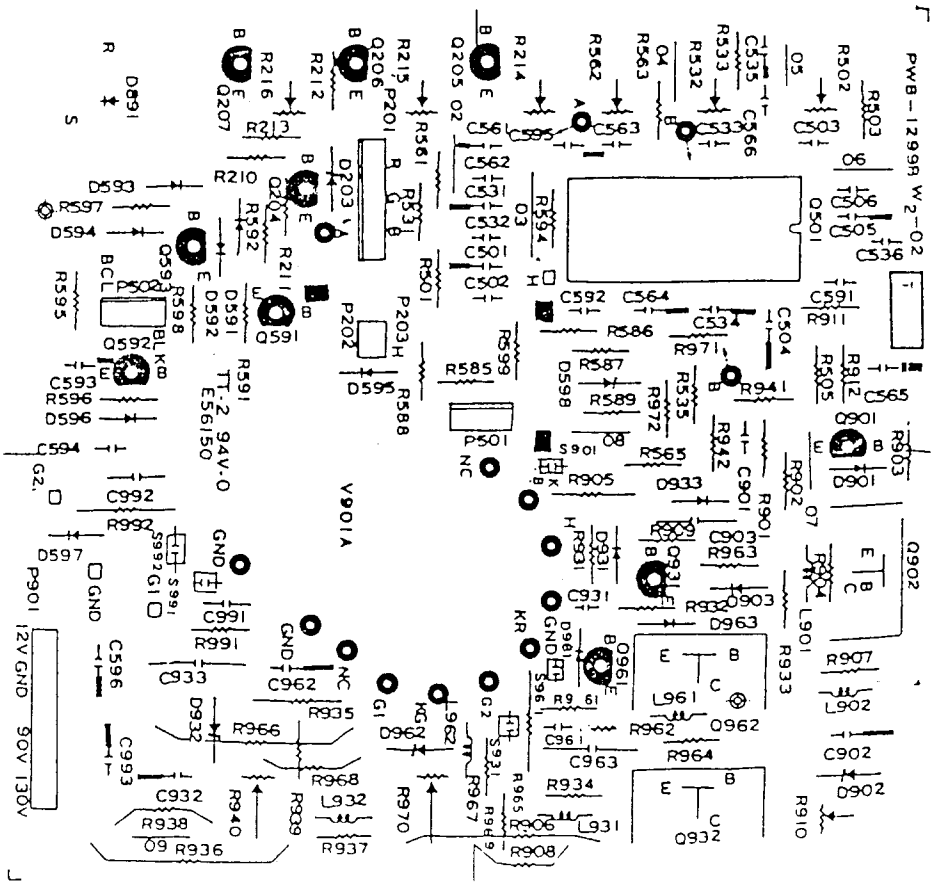
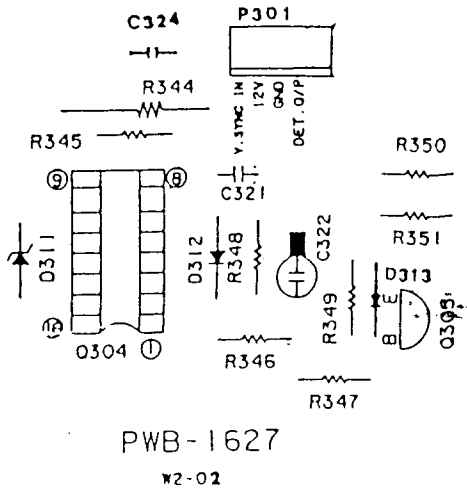


Fig 9-5 VERTICAL SIZE CTL CIRCUIT BOARD LAYOUT



.S CIRCUIT BOARD LAYOUT

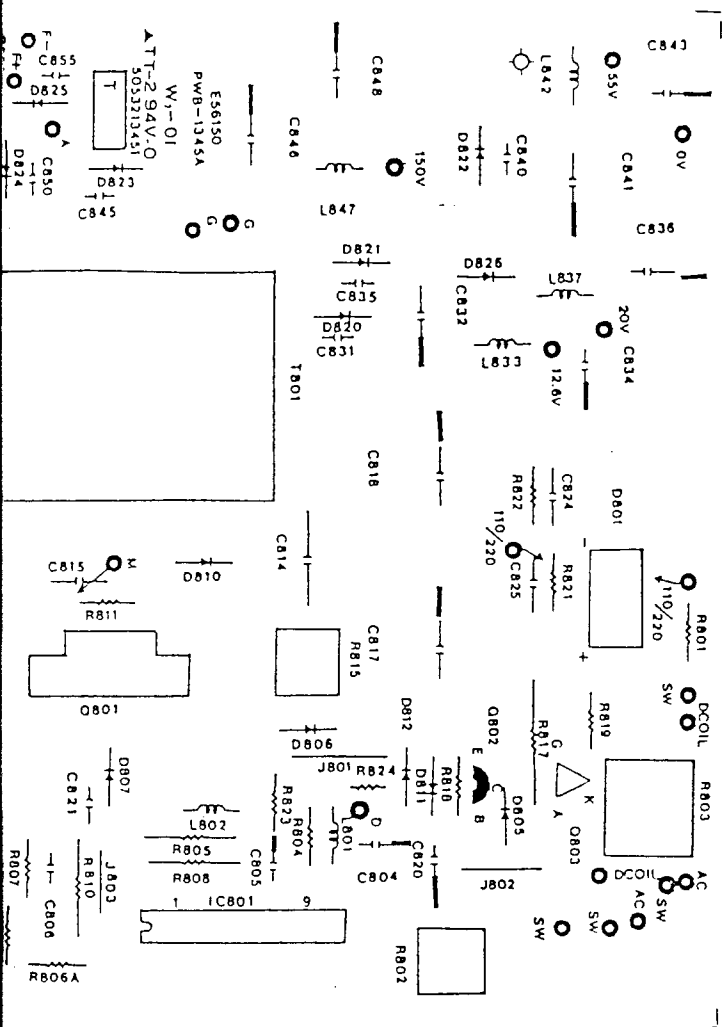


Fig 9-4 LINE FILTER CIRCUIT BOARD LAYOUT

.VE BOARD LAYOUT

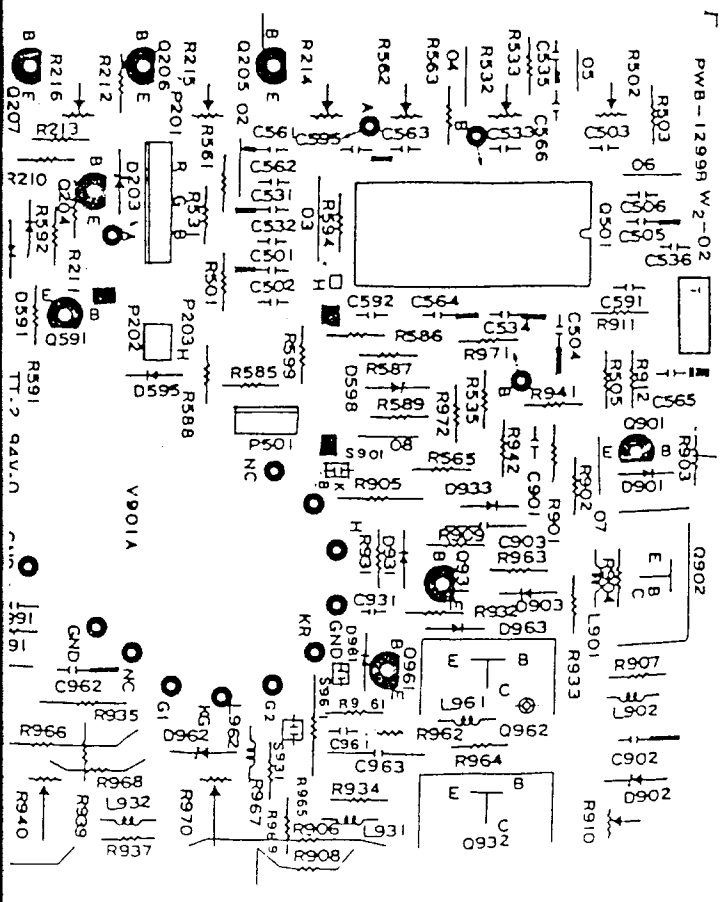
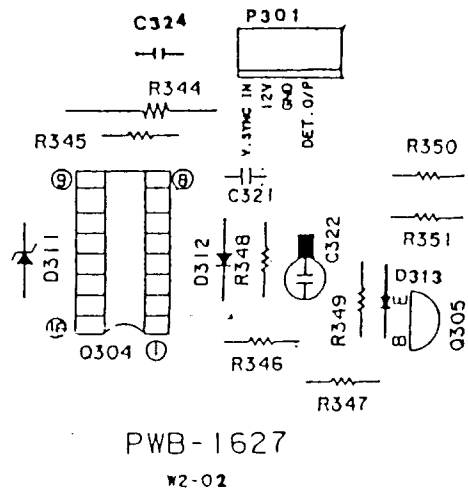


Fig 9-5 VERTICAL SIZE CTL CIRCUIT BOARD LAYOUT



9.CIRCUIT BOARD LAYOUTS

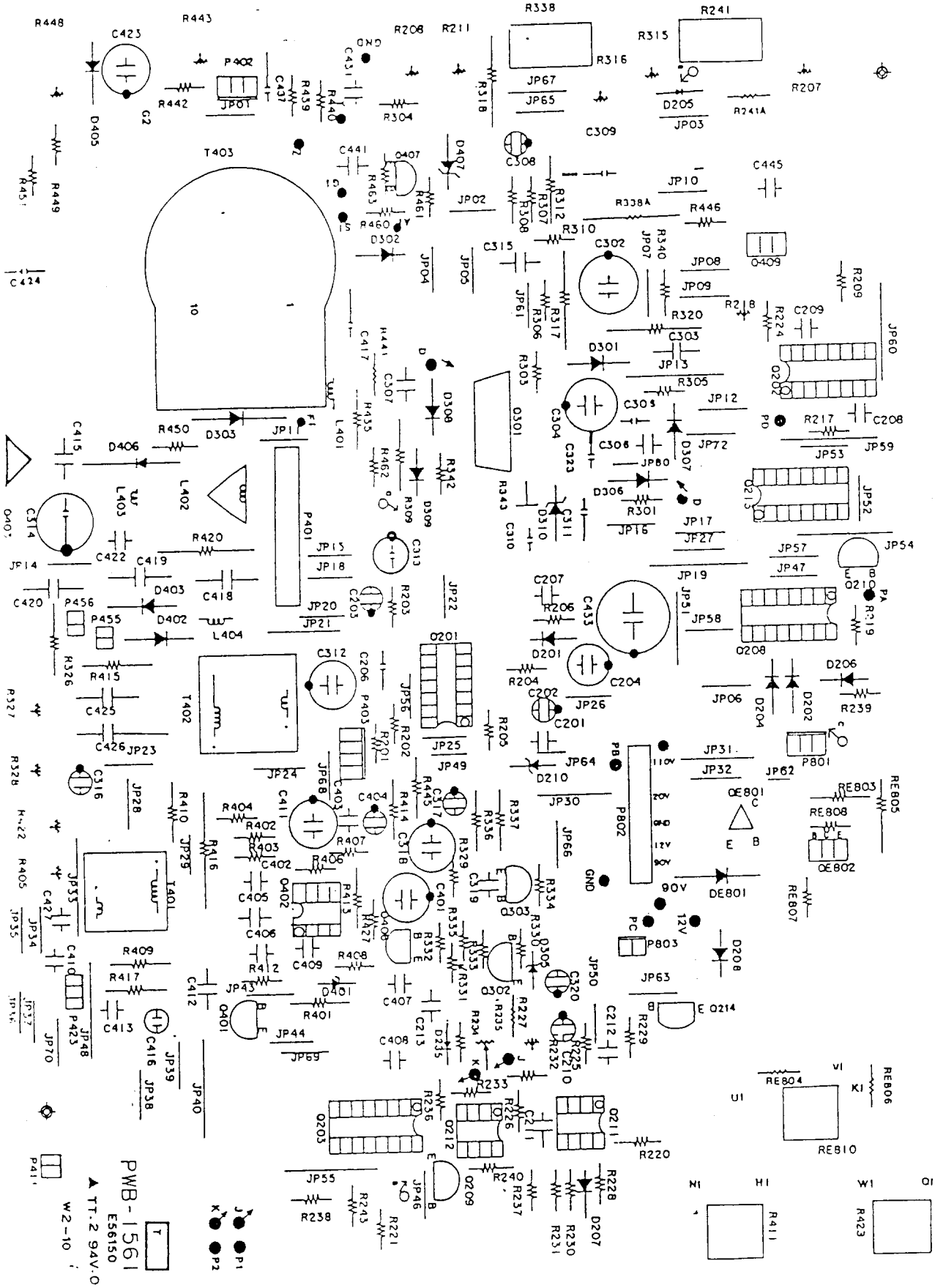
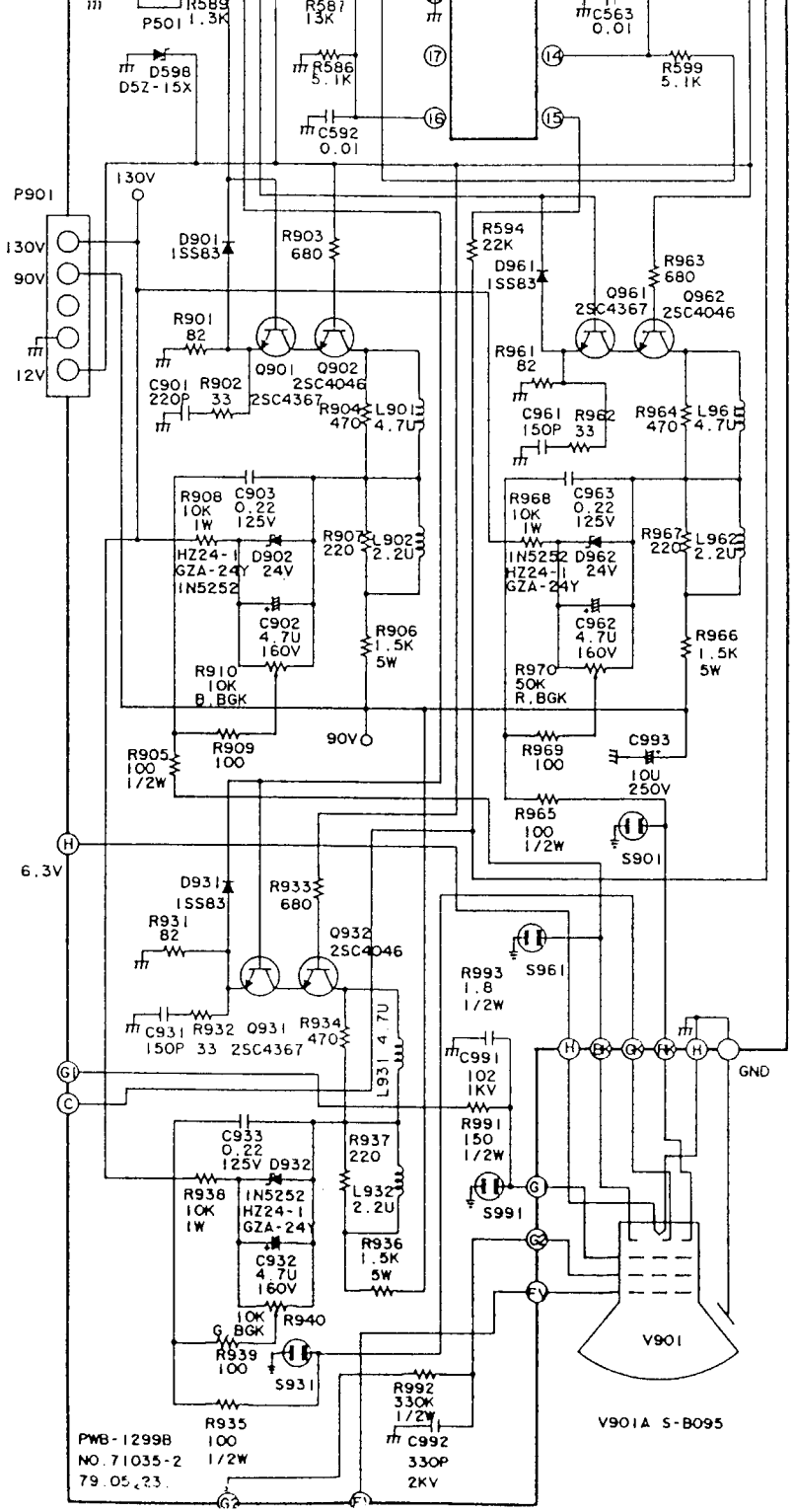


Fig 9-1 MAIN CIRCUIT BOARD LAYOUT


P501
R589 1.3K
D598 D5Z-15X
R587 13K
R586 5.1K
C592 0.01
C563 0.01
R599 5.1K
P901
130V
90V
12V
D901 1SS83
R903 680
R901 82
C901 220P
R902 33
Q901
Q902 2SC4046
2SC4367
R904 470
L901 4.7U
R908 10K 1W
C903 0.22 125V
HZ24-1 GZA-24Y IN5252
D902 24V
R907 220
L902 2.2U
C902 4.7U 160V
R906 1.5K 5W
R910 10K B.BGK
R909 100
R905 100 1/2W
90V
R594 22K
D961 1SS83
R963 680
Q961 2SC4367
Q962 2SC4046
R961 82
C961 150P
R962 33
R964 470
L961 4.7U
R968 10K 1W
C963 0.22 125V
IN5252 HZ24-1 GZA-24Y
D962 24V
R967 220
L962 2.2U
C962 4.7U 160V
R966 1.5K 5W
R970 50K R.BGK
R969 100
C993 10U 250V
R965 100 1/2W
S901
6.3V
D931 1SS83
R933 680
R931 82
Q932 2SC4046
C931 150P
R932 33
Q931 2SC4367
R934 470
L931 4.7U
S961
R993 1.8 1/2W
C991 102 1KV
R991 150 1/2W
S991
GND
C933 0.22 125V
D932
R937 220
L932 2.2U
R938 10K 1W
IN5252 HZ24-1 GZA-24Y
C932 4.7U 160V
R936 1.5K 5W
10K BGK
R940
R939 100
S931
R935 100 1/2W
R992 330K 1/2W
C992 330P 2KV
V901
V901A S-B095
PWB-1299B
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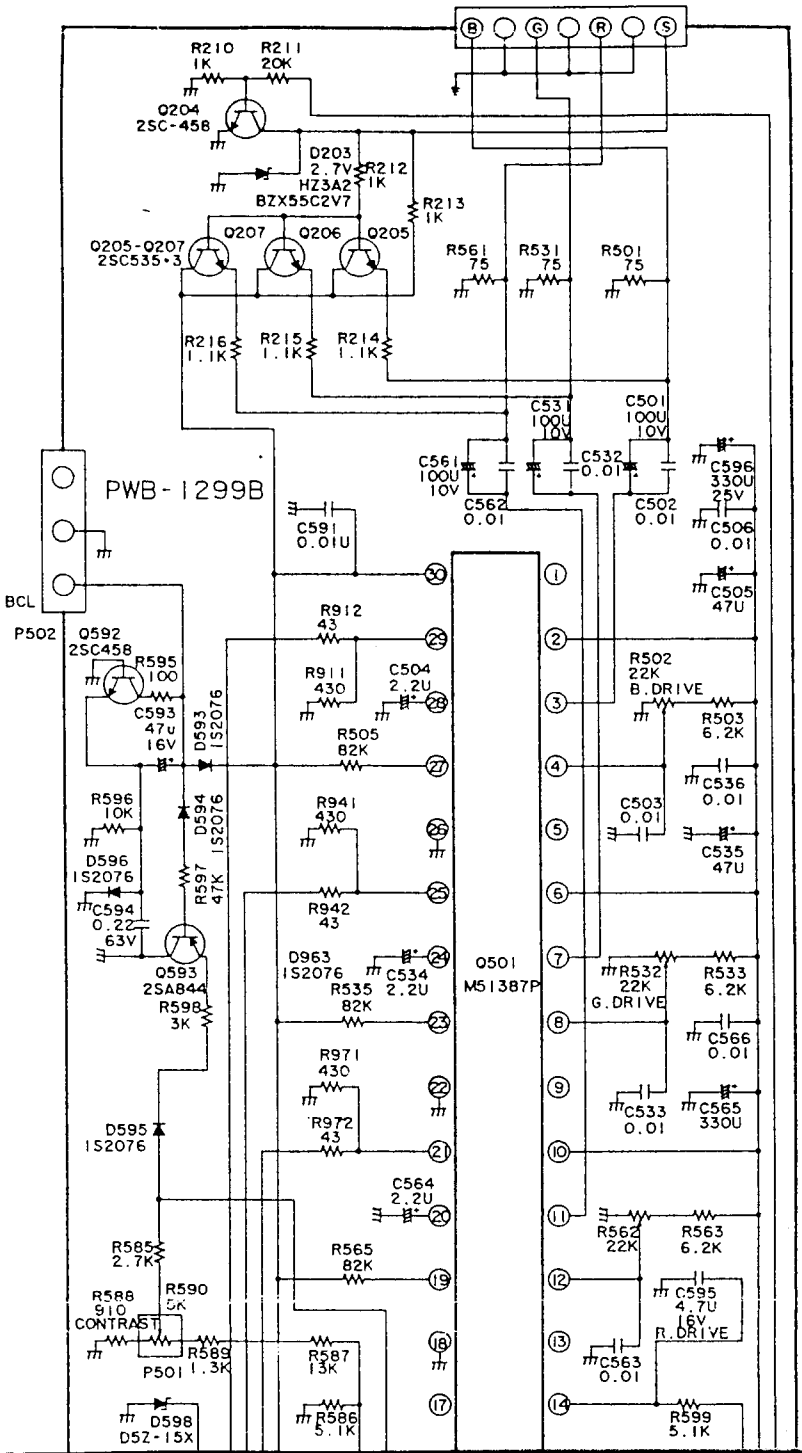
79.05.23.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2SA844
D203
2.7V
HZ3A2
BZX55C2V7
D593
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D595
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D596
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D598
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D963
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R210
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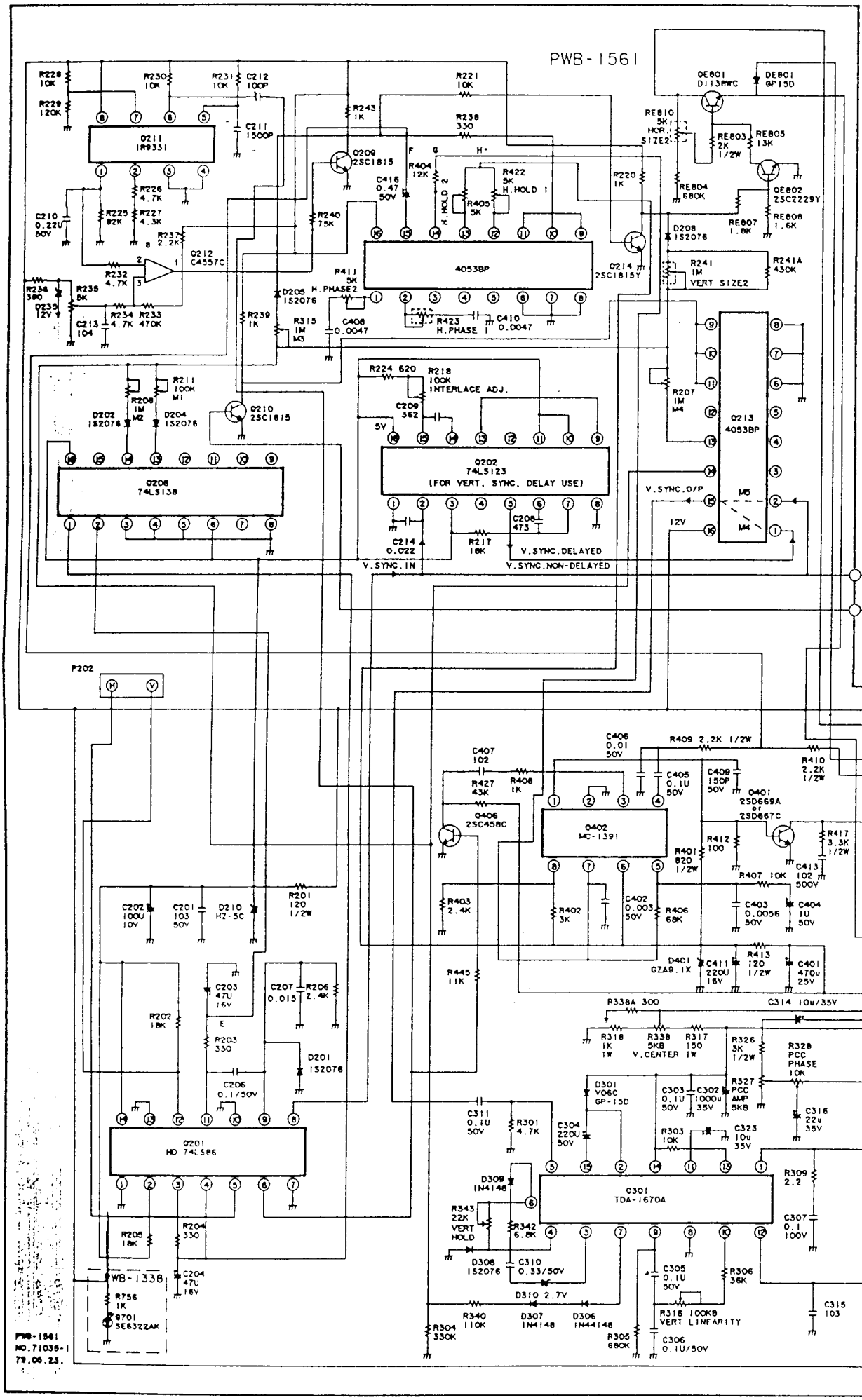
R211
20K
R212
1K
R213
1K
R214
1.1K
R215
1.1K
R216
1.1K
R501
75
R531
75
R561
75
R502
22K
B.DRIVE
R503
6.2K
R532
22K
G.DRIVE
R533
6.2K
R562
22K
R563
6.2K
R565
82K
R585
2.7K
R586
5.1K
R587
13K
R588
910
CONTRAST
R589
1.3K
P501
R590
5K
R595
100
R596
10K
R597
47K
R598
3K
R599
5.1K
R912
43
R911
430
R505
82K
R941
430
R942
43
R535
82K
R971
430
R972
43
C564
2.2U
C591
0.01U
C501
100U
10V
C531
100U
10V
C561
100U
10V
C562
0.01
C532
0.01
C502
0.01
C503
0.01
C504
2.2U
C506
0.01
C505
47U
C596
330U
25V
C536
0.01
C535
47U
C566
0.01
C565
330U
C533
0.01
C534
2.2U
C593
47u
16V
C594
0.22
63V
C595
4.7U
16V
R.DRIVE
C563
0.01
B
G
R
S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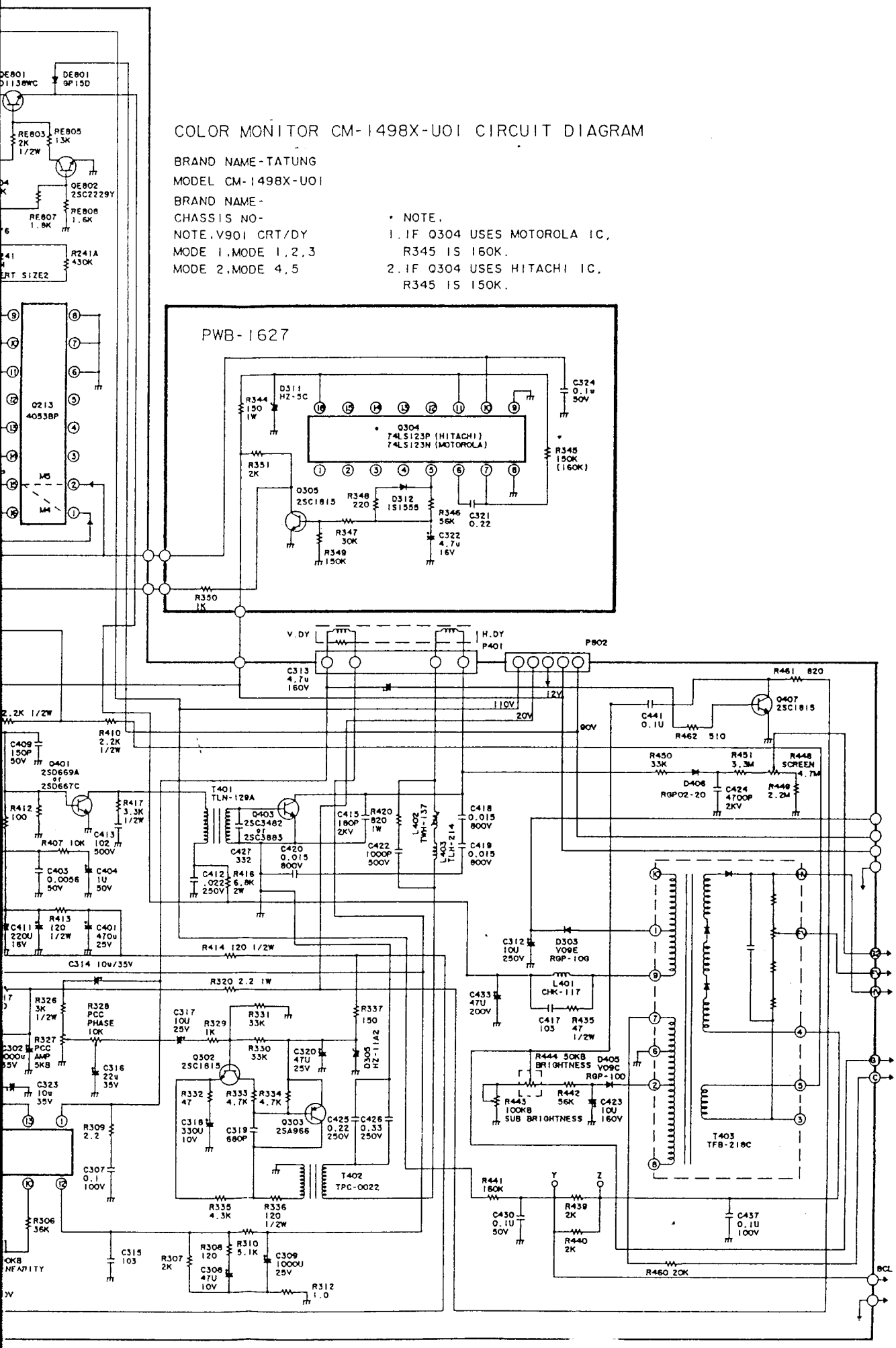
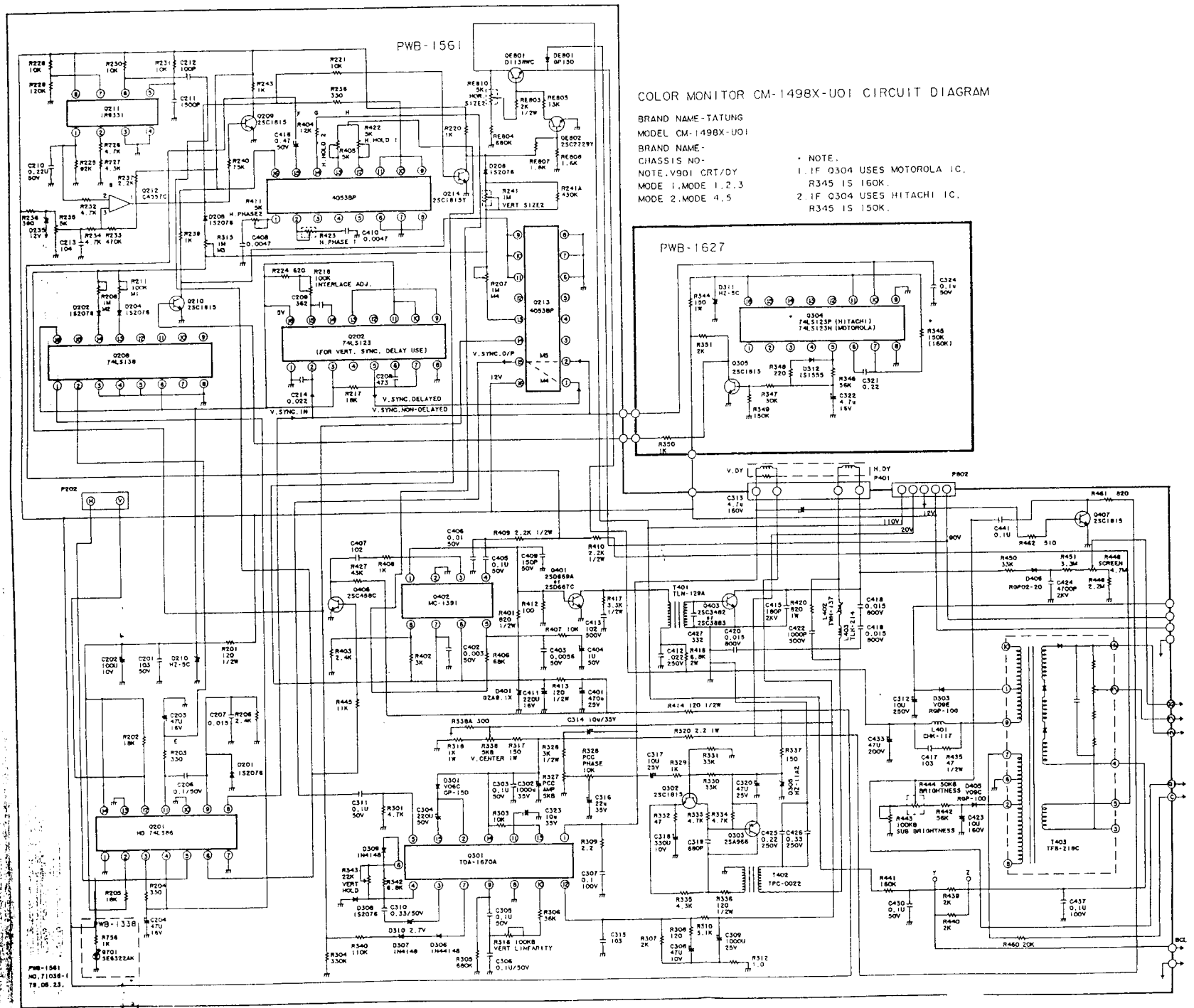
COLOR MONITOR
BRAND NAME-TATUNG
MODEL CM-1498X-U01
BRAND NAME-
CHASSIS NO-
NOTE.V901 CRT/DY
MODE 1,MODE 1,2,3
MODE 2,MODE 4,5
PWB-1627
PWB-1338
PWB-1561
NO.71038-1
79.06.23.

COLOR MONITOR CM-1498X-U01 CIRCUIT DIAGRAM

BRAND NAME-TATUNG
MODEL CM-1498X-U01
BRAND NAME-
CHASSIS NO-
NOTE.V901 CRT/DY
MODE 1.MODE 1,2,3
MODE 2.MODE 4,5

• NOTE.
1.IF Q304 USES MOTOROLA IC, R345 IS 160K.
2.IF Q304 USES HITACHI IC, R345 IS 150K.

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COLOR MONITOR CM-1498X-U01 CIRCUIT DIAGRAM
BRAND NAME-TATUNG
MODEL CM-1498X-U01
BRAND NAME-
CHASSIS NO-
NOTE.V901 CRT/DY
MODE 1.MODE 1,2,3
MODE 2.MODE 4,5
* NOTE.
1.IF Q304 USES MOTOROLA IC,
R345 IS 160K.
2.IF Q304 USES HITACHI IC,
R345 IS 150K.
Q211 IR9331
Q209 2SC1815
Q212 C4557C
4053BP
Q214 2SC1815T
Q208 152078
Q210 2SC1815
Q202 74LS123
(FOR VERT. SYNC. DELAY USE)
Q208 74LS138
Q213 4053BP
V.SYNC.O/P
V.SYNC.IN
V.SYNC.DELAYED
V.SYNC.NON-DELAYED
Q304 74LS123P (HITACHI)
74LS123N (MOTOROLA)
Q305 2SC1815
Q307 2SC1815
Q302 2SC1815
Q303 2SA968
Q407 2SC1815
Q402 MC-1391
Q401 2SD669A
2SD667C
Q406 2SC458C
Q301 TDA-1670A
Q201 HD 74LS86
T401 TLH-129A
T402 TPC-0022
T403 TFB-Z16C
D311 HZ-5C
D312 (S)1555
D303 V09E RGP-100
D405 V09C RGP-100
D406 RGP02-20
D401 BZA9.1X
D307 IN4148
D308 IN4148
D306 IN4148
L401 CHK-117
L402 TLH-137
L403 TLH-214
P202
P802
P401
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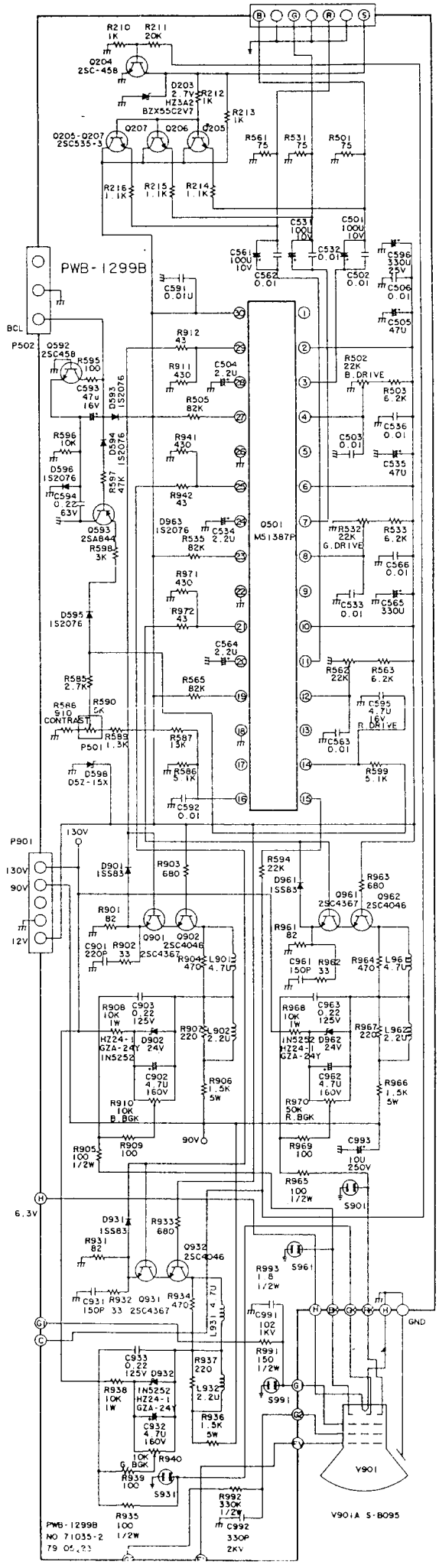
H.DY
110V
12V
20V
90V
5V
PWB-1561
NO.71038-1
78.08.23.


PWB-1299B
P502
BCL
P501
P901
130V
90V
12V
6.3V
GND
V901
V901A S-B095
PWB-1299B
NO 71035-2
79 05 23
Q0501
M51387P
Q204 2SC-458
Q205-Q207 2SC535-3
Q207
Q206
Q205
Q592 2SC458
Q593 2SA844
Q901 Q902 2SC4046
Q961 2SC4367
Q962 2SC4046
Q931 Q932 2SC4046
Q931 2SC4367
D203 2.7V HZ3A2 BZX55C2V7
D901 1SS83
D961 1SS83
D931 1SS83
D902 HZ24-1 GZA-24Y IN5252
D962 IN5252 HZ24-1 GZA-24Y
D932 IN5252 HZ24-1 GZA-24Y
D593 1S2076
D594 1S2076
D596 1S2076
D963 1S2076
D595 1S2076
D598 052-15x
R210 1K
R211 20K
R212 1K
R213 1K
R214 1.1K
R215 1.1K
R216 1.1K
R561 75
R531 75
R501 75
R912 43
R911 430
R505 82K
R941 430
R942 43
R971 430
R972 43
R595 100
R596 10K
R597 47K
R598 3K
R585 2.7K
R586 910 CONTRAST
R590 5K
R589 1.3K
R587 15K
R586 5.1K
R565 82K
R535 82K
R502 22K B.DRIVE
R503 6.2K
R532 22K G.DRIVE
R533 6.2K
R562 22K
R563 6.2K
R599 5.1K
R594 22K
R963 680
R903 680
R901 82
R902 33
R904 470
R961 82
R962 33
R964 470
R908 10K 1W
R907 220
R906 1.5K 5W
R910 10K B.BGK
R909 100
R905 100 1/2W
R968 10K 1W
R967 220
R966 1.5K 5W
R970 50K R.BGK
R969 100
R965 100 1/2W
R933 680
R931 82
R932 0931
R934 470
R937 220
R938 10K 1W
R936 1.5K 5W
R940 10K G.BGK
R939 100
R935 100 1/2W
R993 1.8 1/2W
R991 150 1/2W
R992 330K 1/2W
C992 330P 2KV
C991 102 1KV
C501 100U 10V
C532 0.01
C502 0.01
C596 330U 25V
C506 0.01
C505 47U
C591 0.01U
C504 2.2U
C503 0.01
C536 0.01
C535 47U
C593 47U 16V
C594 0.22 63V
C534 2.2U
C533 0.01
C566 0.01
C565 330U
C564 2.2U
C595 4.7U 16V R.DRIVE
C563 0.01
C592 0.01
C901 220P
C902 4.7U 160V
C903 0.22 125V
C961 150P
C962 4.7U 160V
C963 0.22 125V
C993 10U 250V
C931 150P
C932 4.7U 160V
C933 0.22 125V
L901 4.7U
L902 2.2U
L961 4.7U
L962 2.2U
L931 4.7U
L932 2.2U
S901
S931
S961
S991

COLOR DISPLAY CM-1496X/CM-1498X SERVICE MANUAL

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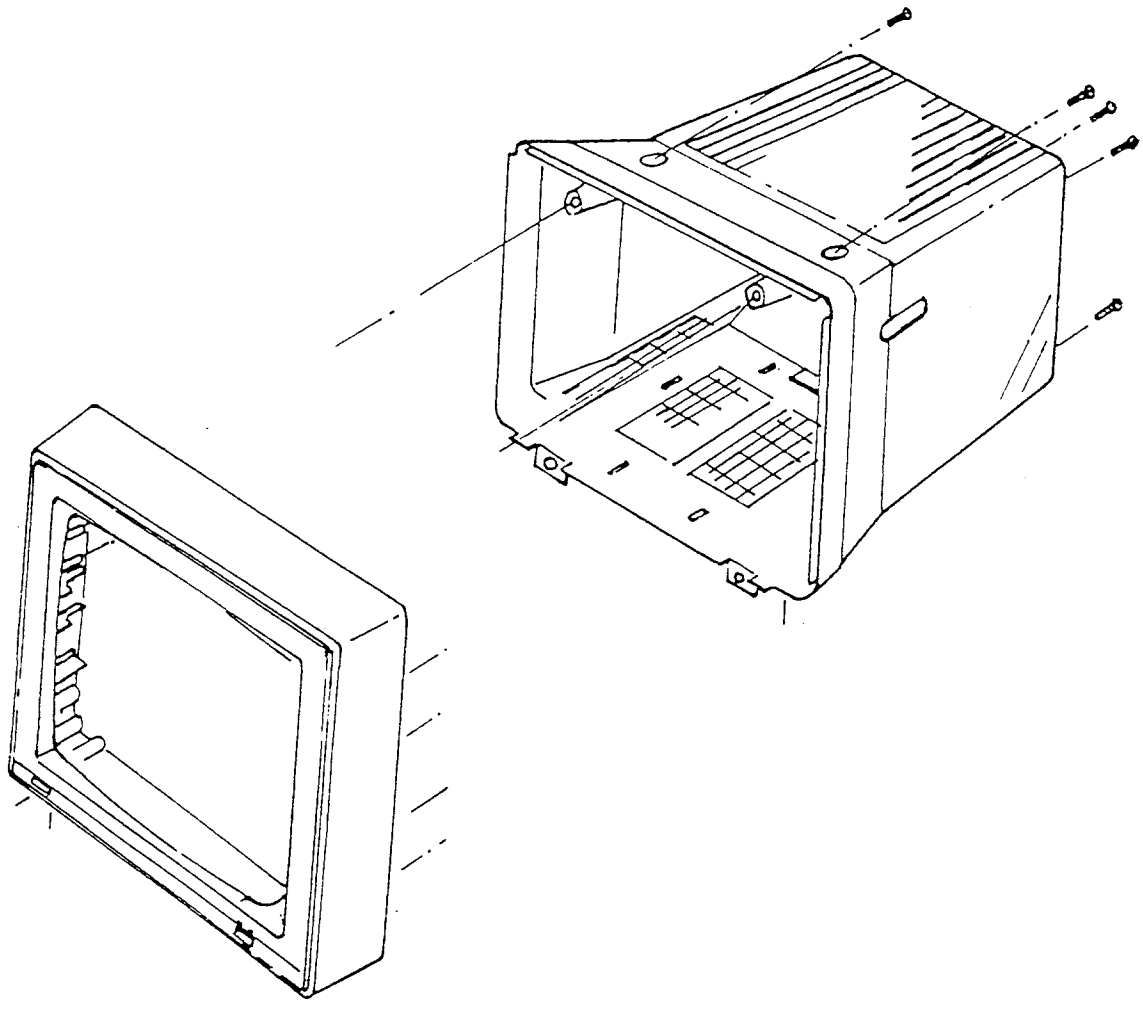
1.REMOVAL OF REAR COVER



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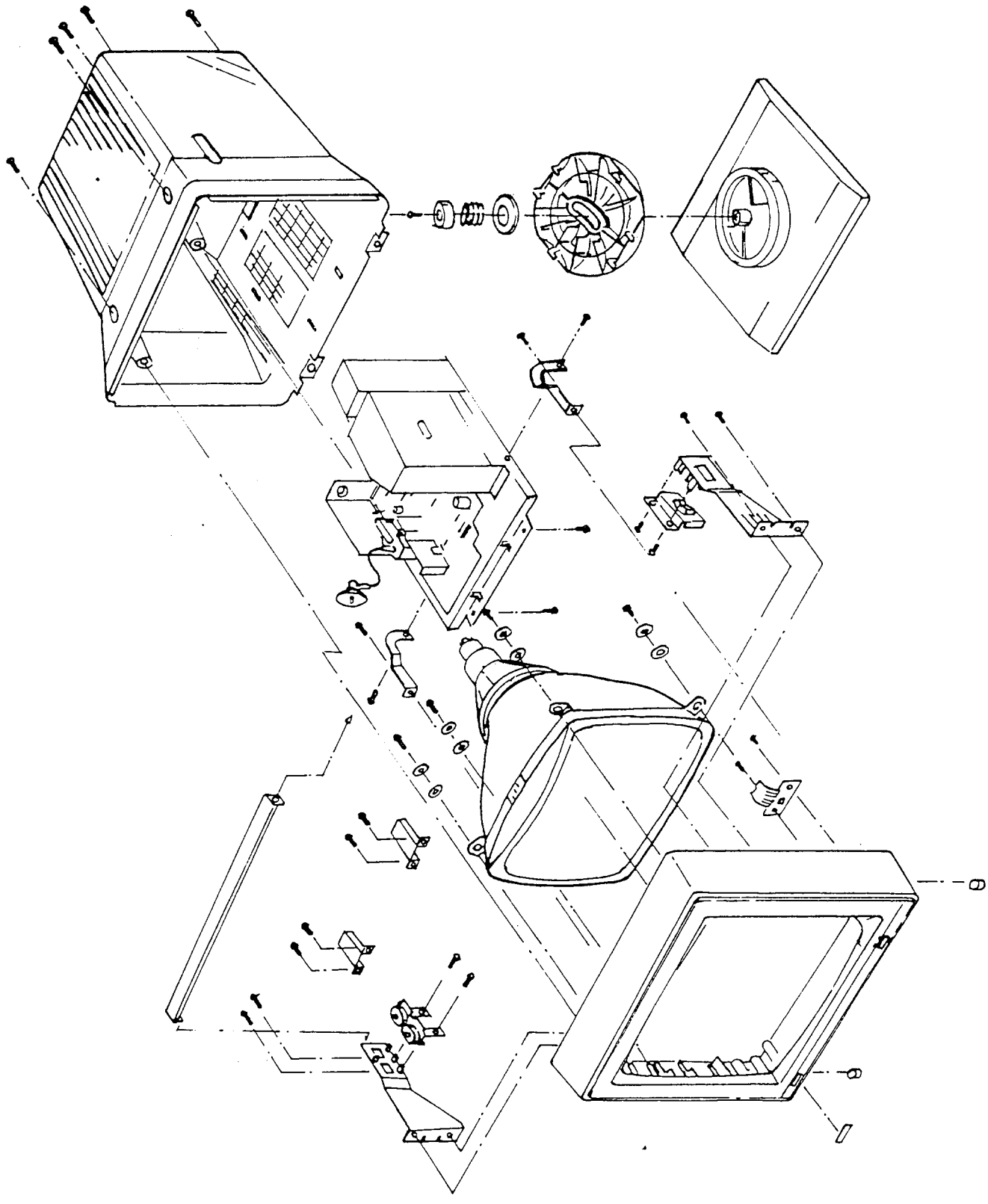
* 2.MECHANICAL DISASSEMBLY *
****



* 3.TECHNICAL INFORMATION *

APPLICATIONS:	Analog R.G.B. input color display for graphics and alphanumeric use
POWER INPUT:	Mains voltage : 100 - 125/200 - 240VAC SWITCHABLE 50/60 Hz 1.0A(100 - 125VAC)/0.6A(200-240VAC)
VIDEO SIGNALS:	Red, green, blue, analog video signals input levels: 0 - 0.7Vp-p
SYNC. SIGNALS:	Vertical frequency : 53 - 90 Hz Horizontal frequency: 31.5 KHz/35.5 KHz
SIGNAL CONNECTOR:	Miniature D- shell male 15 Pin connector
DISPLAY TUBE:	14"(13V), 90 degree deflection, 0.31 mm dot pitch, (CM-1496X) ,0.28mm dot pitch, (CM-1498X) P22 phosphor, light transmission rate 46% reflectivity 45% - 65%
DATA AREA:	180 x 240 mm
LINEARITY:	6% Max.
MISCONVERGENCE:	Center: 0.3 mm Max. Corner: 0.5 mm Max. (CM-1496X) 0.4 mm Max. (CM-1498X)
WHITE COLOR: COODINATES	X: 0.313 Y: 0.329
USER CONTROLS:	Power ON - OFF switch, Brightness control (with center detent), contrast control H.PHASE 1,2,3 H.PHASE 4 H.SIZE 4,5 V.CENTER, V.SIZE 4,5 CONTROL
OPERATING AMBIENT:	Temperature: 0 - 35 C Relative humidity: 10 - 80%
WEIGHT:	12.5 kg (net)

****
* **4.GENERAL** *
****

CM-1496X/CM-1498X is a high resolution color display using a 0.31/0.28 mm dot pitch CRT with etched faceplate. Analog 16-levels R.G.B. video signals and TTL-level seperte sync. signals are adopted for graphic and text display.

It is designed to provied you with a wide range of compatibility with various industry graphic standards such as, the IBM VGA PS/2, super VGA 800X600, IBM 8514A 1024X768 and incorporates the automatic vertical sizing circuitry that provides automatic sizing resolution of 640X350 up to 1024X768.

A self-test pattern shall be available when the signal cable is disconnected from the driver source. The self-test pattern will consist of a full white raster extending beyond the display bezel at the top and bottom, with a vertical black bar on the left and/or right edges.

* 5.DESCRIPTION OF OPERATION *

5-1 SWITCHING MODE POWER SUPPLY CIRCUIT

The TDA4601 is designed for driving controlling and protecting the switching transistor in flyback converter power supplies during start-up normal and overload operation as well as during disturded operation . In case of disturbance the drive of the switching transistor is inhibited and a secandary voltage rise is prevented.

A. The start-up procedures include three consecutive operating phase as follows:
   1. Build-up internal reference voltage
      The intenal reference voltage supplies the voltage regulator and effects charging of the coupling electrolytic capacitor cannected to the switching transistor.
   2. Enabling of internal voltage reference voltage V1=4V
      Simultaneously with va reaching approx 12V, an internal voltage becomes available providing all component elements, with the exception of the control logic with a thermally stable and overload resistant current supply.
   3. Enabling of control logic
      In conjunction with the generation of the reference voltage. The current supply for the control logic is activated by means of an additional stabilization circuit The integrated circuit is then ready for operation.

B. Normal operation mode/control operation mode
   At the input of Pin 2 the zero passage of the frequency provided by the feedback coil are registered and forwarded to the control logic Pin 3 (control input overload and standing identification) receives the rectified amplitude fluctcations of the feedback coil the control amplifier operates with an input voltage of approx 2V and a current of approx 1.4mA depending on the internal voltage reference.
   The overload identification limits in conjunction with collector current simulator Pin 4 the operating range of the control amplifier The collctor current is simulated by an external RC combination present at Pin 4 and internally set threshold voltage The largest possible collector current applicable with the switching transistor increase in propovtion to the increased capactance C808 thus the reguired operating range of the control amplifier is established the range of control lies between a DC voltage clamped at 2V and a sawtooth-shaped rising AC voltage which can vary up to a max amplitude of 4V (reference voltage) during secondary load reduction the switching frequency is increased and. Pin 5 it is possible to externally inhibit the operation of the IC, the output at Pin 8 will be inhibited when volltage of $\leq$ Vref -0.1V are present at Pin 5.
   And the base current amplifier forwards the sawtooth-shaped V4 voltage to the outputt of Pin 8. A current feedback with an external resistor R804 is present between Pin 8 and Pin 7. the applied value of the resistor determines the max amplitude of the base driving current for the switching transistor.

C. Protective operation mode
   The base current shut-down activated by the control logic clamps the output of Pin 7 to 1.6V. As a result the drive of the switching transistor is inhibited . This protective measure is enabled if the supply voltage at Pin 9 reaches a value$\leq$6.7 V or if voltage of $\leq \frac{Vref}{2}$

-0.1V are present at Pin 5.

5-2 AUTOMATIC DEGAUSSING CIRCUIT

Posistor R803 and degaussing coil L991 compose an Automatic Degaussing (ADG) circuit to demagnetic the shadow mask and internal shield in the CRT.

Posistor shows low resitance value in normal temperature, when apply AC line voltage, current of about 20 Ap-p flows into degaussing coil, after seconds, resistance of posistor increase rapidly due to rising in heat, degaussing current thus decrease to less than 120 m Ap-p, degaussing function is completed.

5-3 VERTICAL DEFLECTION CIRCUIT

The vertical sync. signal is applied to Pin 5 & Pin 4 of Q301. R342, R343, C310 connected to Pin 3 , Pin 4 and Pin 6 determin the free-running frequency of the oscillator inside Q301.

The resistance between Pin 7 of Q301 and ground defines the current mirror and then the height of the scanning.

Pin 9 of Q301 is output of the current mirror that changes the series of C305 and C306. This Pin is also the input of buffer stage.

Pin 10 of Q301 is the output of the buffer stage.

Pin 12 of Q301 is the inverting input of the amplifier.

R307 and R310 define the DC level across C309, so allowing a correct centering of the output voltage. R308 and C308 in conjuction with R307 and R310, applied at the feedback input Pin 12 of Q301, a small part of the parabola, available across C309, and the AC feedback voltage, taken across R312. R305, R308 and R310 produce the linearity correction on the output scanning current.

The output of power amplifier from the Pin 1 of Q301 drives the vertical deflection yoke by a negative slop current ramply, R309 and C307 are used to stabilize the power amplifier.

The supply voltage of the power output stage is forced at Pin 2. During the trace time the supply votage is obtained from the main supply votage by D301, while during the retrace time this Pin is supplied from the internal flyback generator.

Pin 15 is the output of the flyback generator that, when driven, jumps from low to high condition. An external capacitor C304 transfers the jump to Pin 2.

Pin 14 of Q301 is the main supply voltage input.

5-4 HORIZONTAL DEFLECTION CIRCUIT

The positive horizontal sync. pulse from Pin 6 of Q201 is converted and amplified by Q406. Then be applied through the differential circuit C407 / R408 to Pin 3 of the horizontal IC Q402.

The positive horizontal flyback pulse derived from Pin 5 of FBT T403 is integrated by the comparable sawtooth-waveform generator which is com-

posed of R410, R411, R423, C408, and C410, then be applied via C405 to Pin 4 of Q402.

The discriminator inside the IC Q402 detects the phase difference between the sync. input from Pin 3 and the sawtooth-waveforme from Pin 4 , the supperimposed pulse output from Pin 5 of Q402 is integrated by the low-pass-filter R407, C404 and C403, AFC voltage is obtained and applied via R406 to Pin 7 of Q402, thereby controlling the oscillator.

The oscillator inside IC Q402 is an RC type with Pin 7 used to control the timing. R404, R405, R422, C402 and C410 altogether determine the horizontal oscillating frequency.

The predriver output of Q402 is at Pin 1 of which duty cycle is controlled by R402 and R403 at Pin 8 of Q402.

Regulated voltage applied at Pin 6 of Q402 is about 8 - 9 volts.

The output signal from Pin 1 of Q402 is then amplified by Q401 and coupled by T401 to the horizontal output stage Q403 for ON-OFF control, thus sawtooth-waveform current through the horizontal deflection coil is obtained.

Also during the retrace time of the horizontal deflection, a horizontal flyback pulse of about 1100 volts is produced at the collector of Q403, this pulse is transfered and rectified by the FBT T403 to obtain high voltage of about 22.0KV for anode of CRT.

5-5 DPC CIRCUIT

The Side Dynamic Pincushion Correction circuit (Side DPC) modulates the raster width as a function of vertical deflection .

The vertical castle-waveform from Pin 1 of Q301 is integrated by C314, R326, R327, R328, C316 etc. to produce a parabolic waveform necessary for side pincushion correction, this parabolic voltage is amplified by Q302 and Q303 stages and then drives the control winding of the saturable reactor T402.

The inductance of the T402 output winding is modulated by the vertical parabolic current, this output winding is inserted in series with the horizontal deflection yoke.

The horizontal yoke current is then modulated by the correction voltage to correct side pincushion distortion.

5-6 VIDEO CIRCUIT

The color display contains three video amplifiers, one for each primary color, these three amplifiers for the red, green and blue CRT guns are identical.

Video amplifier consists of preamplifier Q501 (M51387P), output stage and cut off adjustment circuit.
The operation of only one channel (blue) is described here.
Analog video signals is preadjusted by R502 and coupling VIA C501, C502 to input of Q501.

Contrast is DC controlled from Pin 14 of Q501, clamp pulse provided from Pin 7 of FBT (T403) to P15 of Q501. The output of Q501 is at Pin 21.

C504 is used for clamp pulse to charge.

The B+ of preamp. (12V) and output stage is provided from S.M.P.S.

The composite blanking pulse is provided from vert. circuit to Q407.G1 clamp the Blanking level to A suitable position.

5-7 MODE CONTROL CIRCUIT

(1) HORIZONTAL FREQUENCY DETECT
H.Sync. pulse with different frequency was sent to Pin 6 of Q211 (F/V CONVERTER) Then there are different voltage at the output Pin 1. So we get a "HIGH" at Pin 1 of Q212 when Hor. freg. is 31.5KHz and "LOW" when Hor. freq. is 35.5KHz. This signal can be used to control Hor. width, Hor. osc. freq., Hor. phase.

(2) HOR. WIDTH CONTROL
When Hf=31KHz, Q212#1 is "H", Q209#C is "L", Q214#C is "H", QE802#C is "L", QE801#B is "L", QE801 cutoff, then DE801 is conducted and 90VDC was sent to FBT #9. When Hf=35KHz, QE801 is conducted and 105VDC is sent to FBT#9 and DE801 is cutoff. Adjusting RE810 can change the base current of QE801, then change the output of QE801 so as Hor. width when Hf=35KHz.

(3) HOR. OSC. FREQ. CONTROL
When Hf=31KHz, Q212#1 is "H", Q209#C is "L", Q203#9#10#11 is "L", then #12#14# are connected. When Hf=35KHz Q203#13#14 are connected, the time constant of Hor. osc. circuit will be changed.

(4) HOR. PHASE CONTROL
When Hf=31KHz, Q203#15#2 are connected. When Hf=35KHz, Q203#15#1 are connected.

(5) VOLTAGE AT POSITIVE END OF C204(POINT "D") and C203(POINT "E")
Q201 74LS86 is an XOR LOGIC IC, If the input pulse of #2 is positive, #3 also positive. This pulse will be filtered by C204 to get a "L" at point"D. However a negative pulse will be filtered as a "H". It's the same condition at point "E". (See tabe 1 for reference). The output at #8 and #6 are always positive for easy sync.

	H.SYNC.	V.SYNC.	POINT "D"	POINT "E"
MODE 1	+	-	L	H
MODE 2	-	+	H	L
MODE 3	-	-	H	H

TABLE 1

(6) SIZE CONTROL OF MODE 3
Q208 74LS138 is a 3-to-8 decoder (Multiplexer). When fH=31KHz, Q209#C is "L", D205 is conducted. Adjusting R315 can vary the picture size of mode 3. From table 1 we can know that Q208#1#2 are "H", so that Q208#13#14 are "H", D202/D204 are cutoff R208/R211 are disabled. Since Q214#C is also "H" R241/R207 are also disabled too.

(7) SIZE CONTROL OF MODE 2
From table 1, D/E are H/L, Q208#14 is "L", D202 are conducted. Adjusting R208 can vary picture size R315 has to be preseted before adjusting R208 since R208 is parallel to R315 now.

(8) SIZE CONTROL OF MODE 1

Q208#13 is "L", R211 is availabe and parallel to R315

(9) SIZE CONTROL OF MODE 4
Q304(PWB-1627) 74LS123 is a monostable multivibrator. We use it to delay the sync. pulse. In mode 4, the period of vertical sync. is around 11.6mS. When We delay that pulse for 11.6mS, it becomes a DC voltage. The DC voltage from Pin 5 will make Q305 saturated. When Q305#C is "L", Q210#C is "H", then Q213#14#13 are connected. R207 is available and parallel to R340, (R241 is always available when fH=35KHz) and in series to R241.

(10) SIZE CONTROL OF MODE 5
When the period of sync. pulse is much longer than 11.6mS (e.g 18mS) There is a negative pulse at Q304#5. Once the pulse in "L" condition, C322 will discharge by the way of D312 . So, C322 cannot have enough voltage to saturate Q305 Then, Q213#14#13 will disconnected and R207 is disabled. Only R241 is available for adjusting.

5-8 SELF TEST

Self test signal suppied from heater buffered by Q205, Q206, Q207 and via R214, R215, R216 to the video input to generate full white screen with black vertical bar on the left and/or right edges. When the display is connected to a system unit the collector of Q204 is grounded to make a dark screen.

5-9 SIGNAL CABLE PIN CONNECTIONS:

Pin	Signal	Pin	Signal
1	Red Signal	9	No Pin
2	Green Signal	10	Digital Ground
3	Blue Signal	11	Jumper to Pin 10
4	Jumper to Pin 10	12	No Pin
5	Self-test	13	Horizontal Sync.
6	Red Return	14	Vertical Sync.
7	Green Return	15	No Pin
8	Blue Return		

6. ALIGNMENT PROCEDURE

6-1 EQUIPMENTS

1. Manual degaussing coil
2. Oscilloscope + probe
3. Digital voltmeter
4. Color analyzer
5. Ruler
6. EHT meter with high voltage probe

6-2 POWER SUPPLY OUTPUT VOLTAGE

Connect a DVM to S.M.P.S. output red wire adjust the voltage to 90V by means of R813.

6-3 VERTICAL FREQUENCY

Connect a frequency counter across the vertical deflection coil. adjust the frequency. To 49Hz by means of R314, the signal cable must be disconnected from the PC.

6-4 HORIZONTAL FREQUENCY

Use a test pattern. Without horizontal sync. input, adjust R422(31.5KHz) and R405(35.5KHz) to get the color bar in an upright position.

6-5 PINCUSHION

Straighten the side lines with R327 and R328.

6-6 WIDTH

Adjust the data area width to 240 +/- 5 mm using L402. (fH=31.5KHz)

6-7 VERTICAL CENTERING

Center the data area with R338.

6-8 VERTICAL LINEARITY

Adjust the squares equal in height with R316.

6-9 HEIGHT 3 (480 lines)

Adjust data area height to 180 +/- 5 mm with R315.

6-10 HEIGHT 2 (400 lines)

Switch to 400 lines mode . Adjust data area height to 180 +/- 5 mm with R208. (Be sure that height 3 has been adjusted)

6-11 HEIGHT 1 (350 lines)

Switch to 350 lines mode . Adjust data area height to 180 +/- 5 mm with R211. (Be sure that height 3 has been adjusted)

6-12 HEIGHT 5 (600 lines)

Switching to 600 lines mode . Adjust data area height to 180 +/- 5 mm with R241.

6-13 HEIGHT 4 (768 lines)

Switching to 768 lines mode . Adjust data area height to 180 +/- 5 mm with R207. (Be sure that height 5 has been adjusted)

6-14 FOCUS ADJUST

Adjust FBT focus VR to get best overall focus screen.

6-15 WHITE X/Y

Turn the brightness VR to center detent position, contrast VR to minimum. Set cut-off drive VR R910/R940/R970 to center.

Turn the sub-brit. VR R443 to a position where to get the G1 voltage is -25V.

Turn the G2 control to a position where to get the brightness just disappears.

Turn the brightness VR to max. and adjust the R910,R940 and R970 to achieve the color coordinates X=0.313 Y=0.329 roughly and brightness 0-5 F.L.

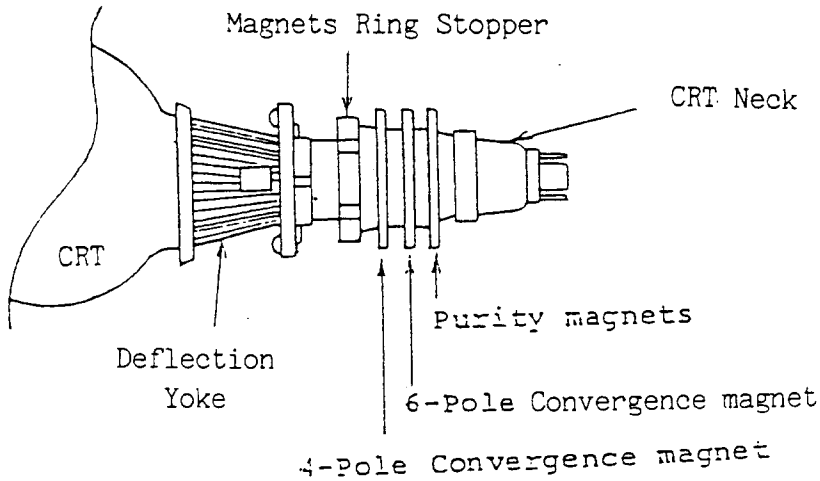
Use full field white pattern, turn the contrast to maximum, brightnes at detent, adjust R502, R532 and R562 to achieve the correct X,Y coordinates. Then turn contrest VR to get 3 F.L. Adjust R910/R940/R970 to achieve correct X,Y coordinates.

6-16 F/V CONVERTER ADJUSTMENT: (MODE 3, FULL WHITE SIGNAL)

Adjsut R235 VR to get 0.7V +/- 0.1 between #P2 (+) and #P1 (-) or between Q212#3(+) and Q212#2(-) after warm up the set for 20 minutes.

6-17 INTERLACE ADJUSTMENT:

Receiving 1024x768(interlaced) signal, display small "s" character. Adjust R218 so that small "s" is not distorted.



6-18 STATIC CONVERGENCE ADJUSTMENT:

NOTE: Before attempting any convergence adjustment, the display should be operate for at least thirty minutes.

(1) Apply the crosshatch pattern to the display.
(2) Adjust the BRIGHTNESS and CONTRAST controls for well defined pattern.
(3) Refer to the structure of picture tube (See Fig 6-1) to make sure the relative position of the convergence magnet.

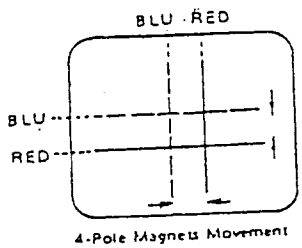


Fig 6-2

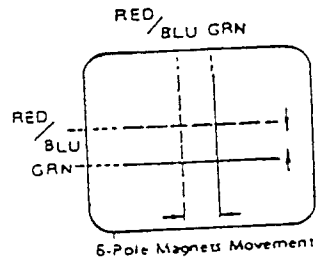
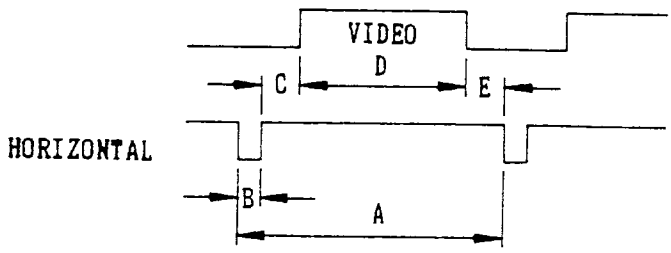
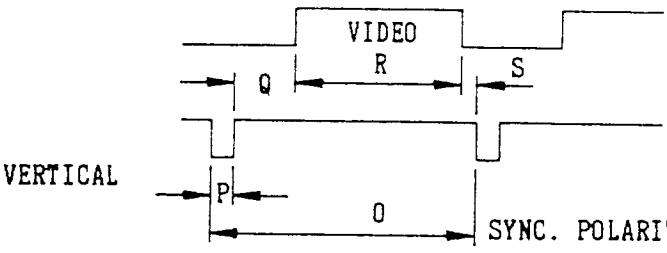


Fig 6-3

(4) Adjust two tabs of the 4-pole Magnets to change the angle between them and superimpose red and blue vertical lines in the center area of the picture (See Fig 6-2).
(5) Turn both tabs at the same time keeping their angles constant to superimpose red and blue horizontal lines at the center of the screen (See Fig 6-2)
(6) Adjust two tabs of 6-pole Magnets to superimpose red/blue line with green one. Adjusting the angle affects the vertical lines and rotating both magnets affects the horizontal lines. (See Fig 6-3)
(7) Repeat adjustments (4). (5). (6). until best convergence is obtained.

6-17 TIMING CHARTS





SYNC. POLARITY : POSITIVE/NEGATIVE

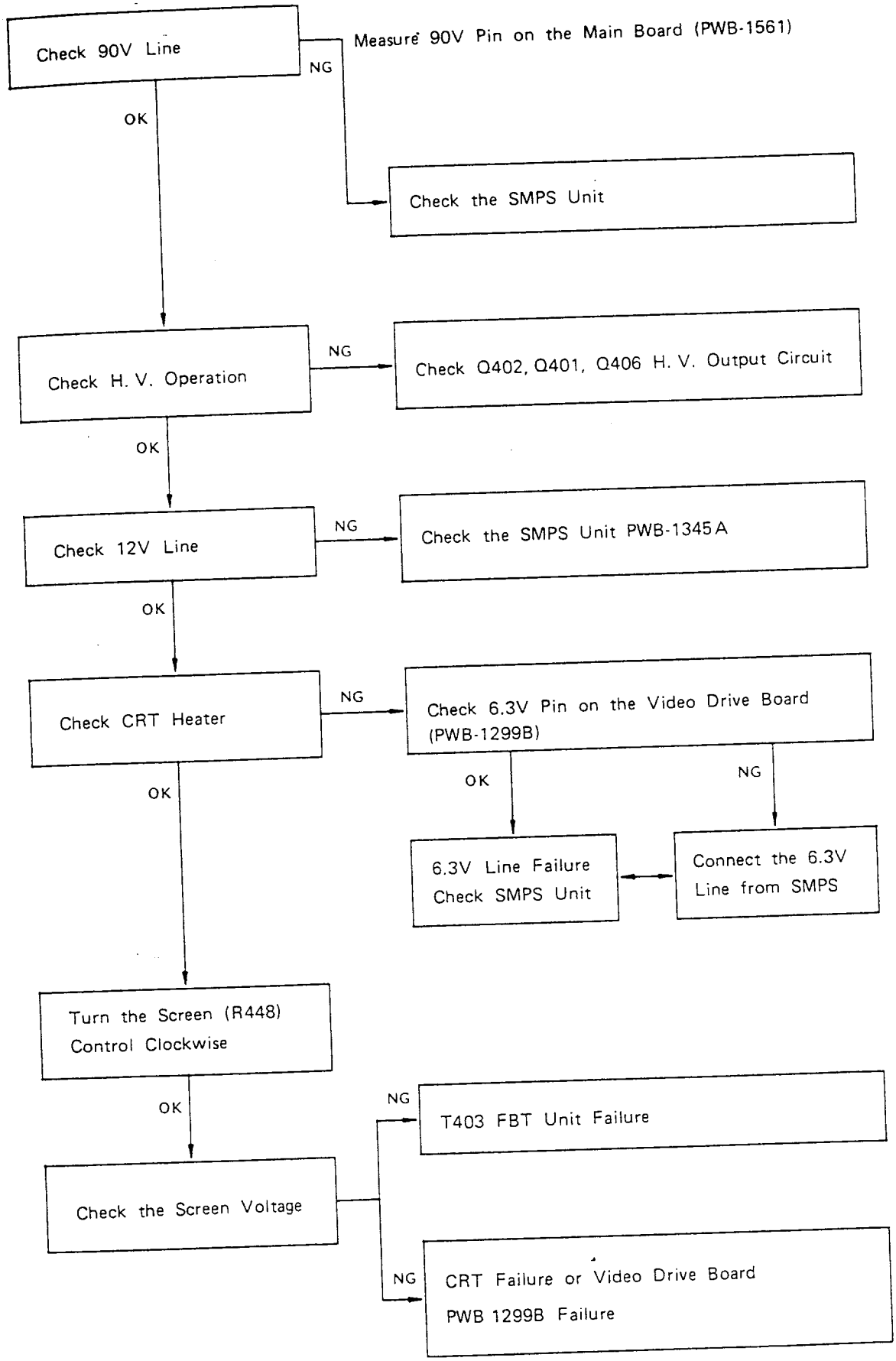
PRE-SET TIMING

	VGA/PS2 COMPATIBLE			8514/A COMPATIBLE	800X600
fH	31.5 KHz			35.52KHz	35.16KHz
Aus	31.77			28.15	28.44
Bus	3.77			3.92	2
Cus	1.89			1.25	3.56
Dus	25.17			22.8	22.22
Eus	0.94			0.18	0.67
Fr	70Hz		60Hz	87 Hz	56 Hz
Oms	14.27	14.27	16.68	11.5	17.78
Pms	0.064	0.064	0.064	0.113	0.06
Qms	1.88	1.08	1.02	0.563	0.6
Rms	11.126	12.716	15.246	10.81	17.07
Sms	1.2	0.41	0.35	0.014	0.03

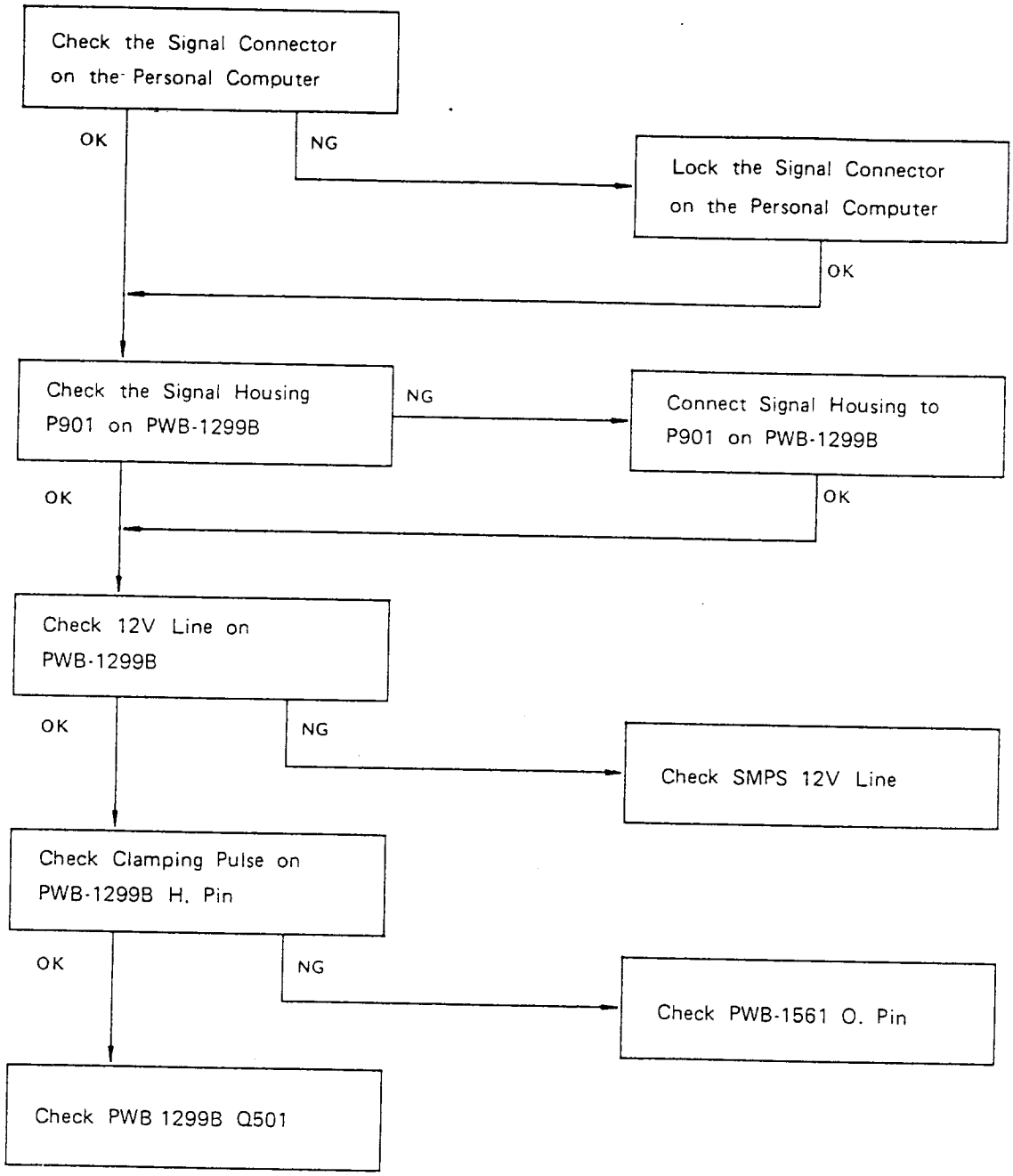
REMARKS	SEPARATE SYNC. H.SYNC. POSITIV V.SYNC. NEGATIVE	SEPARATE SYNC. H.SYNC. NEGATIVE V.SYNC. POSITIVE	SEPARATE SYNC. H.SYNC. NEGATIVE V.SYNC. NEGATIVE	INTERLACED SEPARATE SYNC. H.SYNC. POSITIVE V.SYNC. POSITIVE	SEPARATE SYNC. H.SYNC. NEGATIVE V.SYNC. NEGATIVE	H.SYNC. POSITIVE V.SYNC. POSITIVE

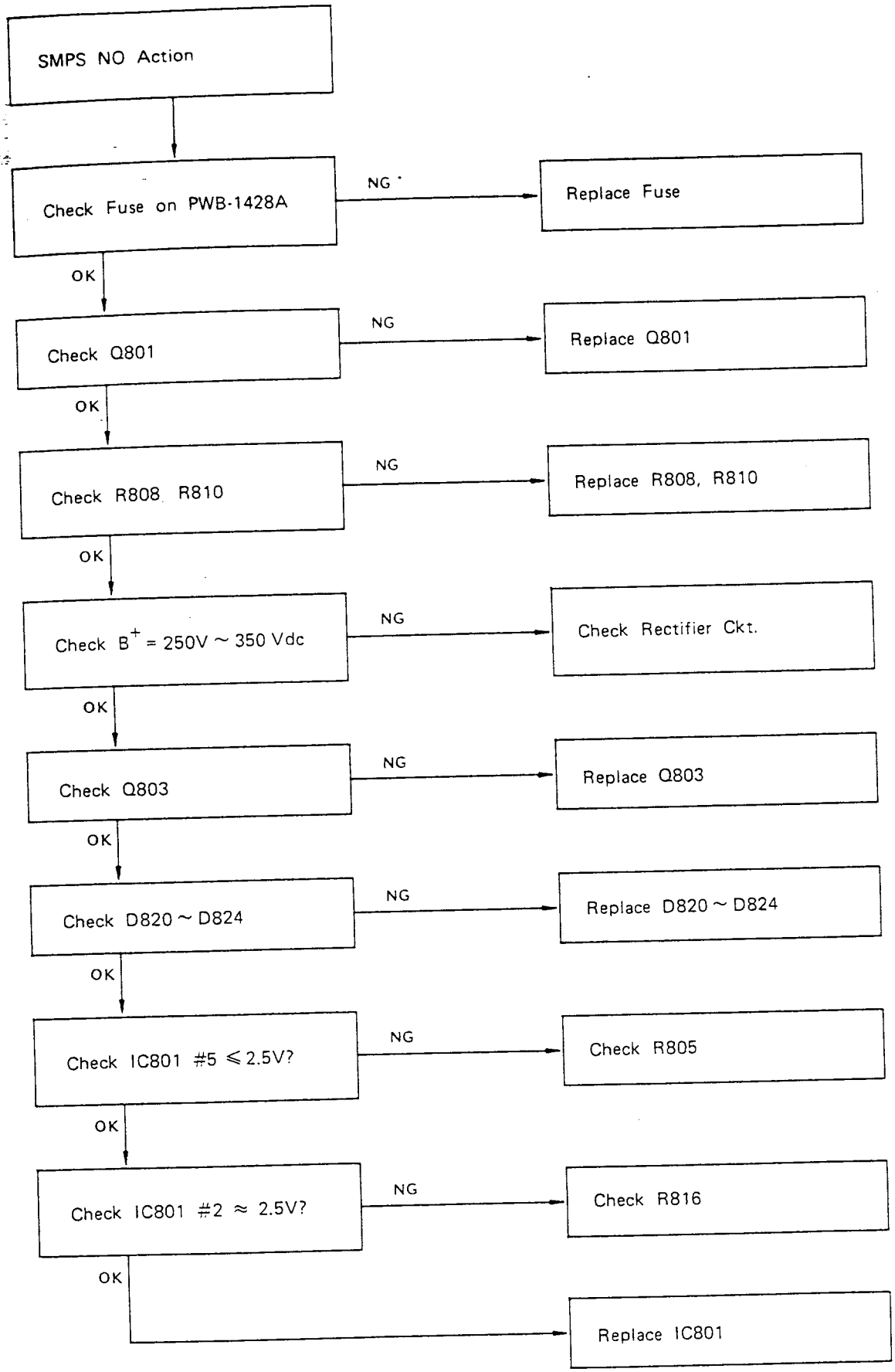
****
* 7. TROUBLE SHOOTING *
****

No Raster

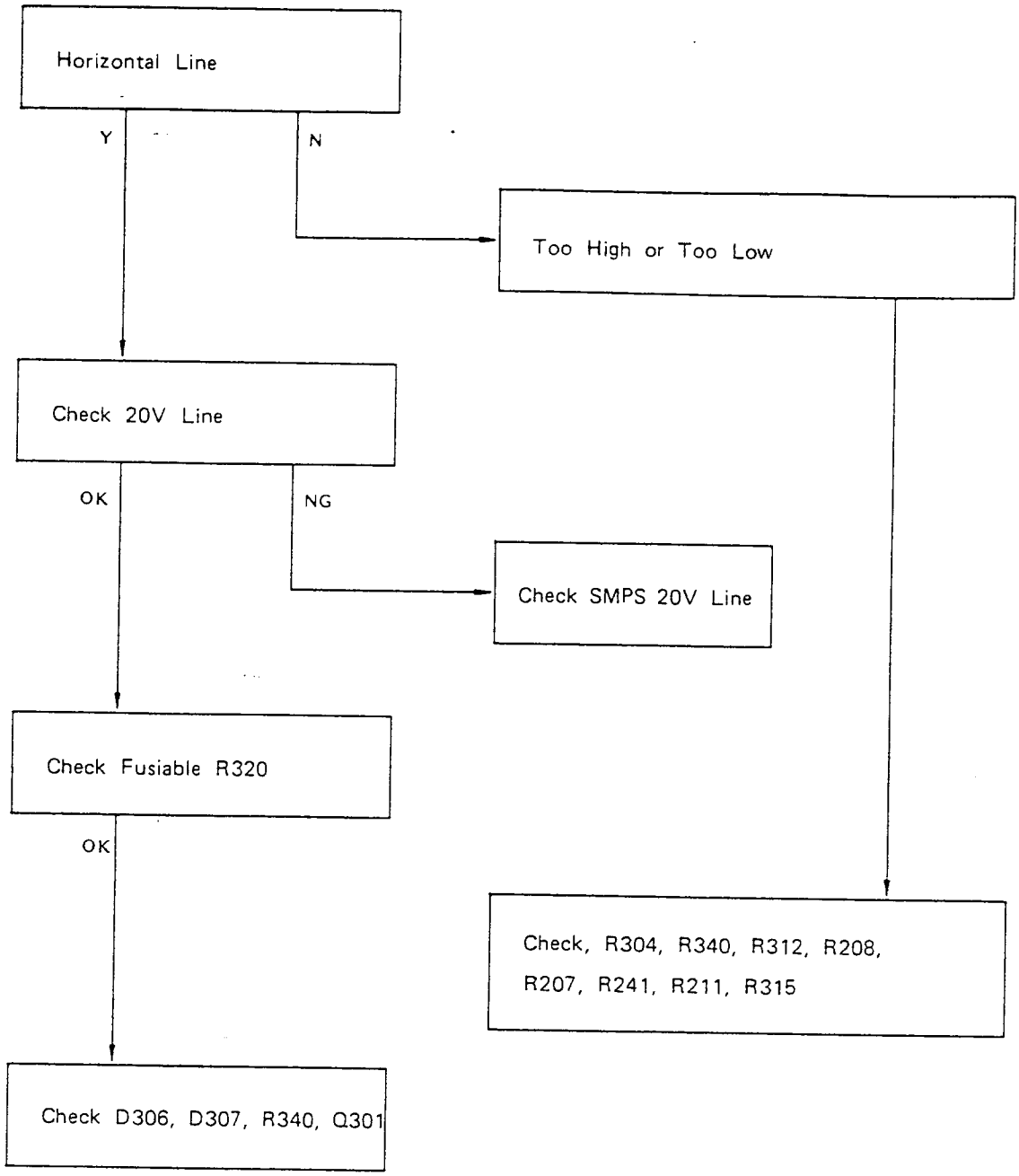


No Picture on the CRT

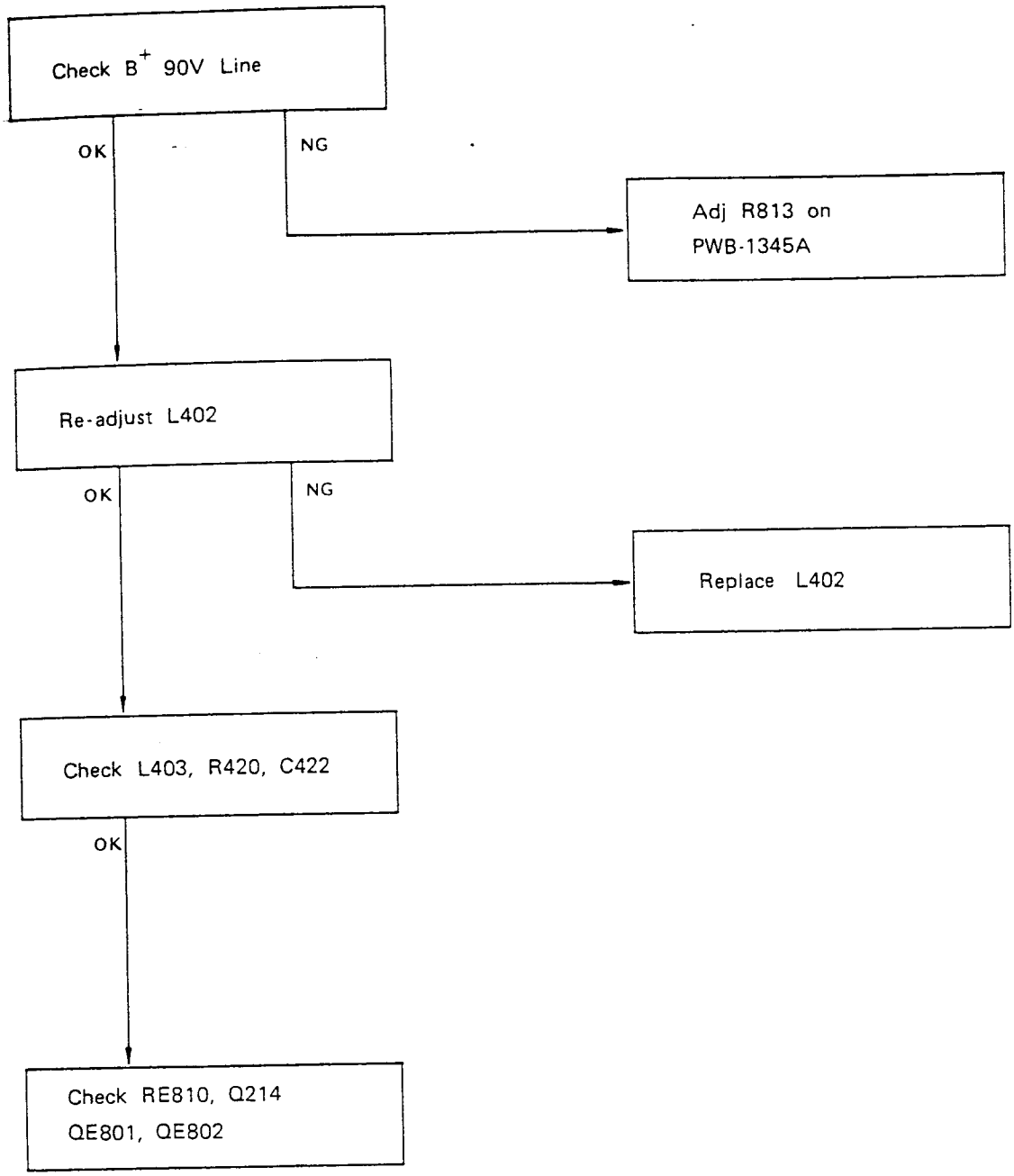



SMPS NO Action
Check Fuse on PWB-1428A
NG
Replace Fuse
OK
Check Q801
NG
Replace Q801
OK
Check R808, R810
NG
Replace R808, R810
OK
Check B+ = 250V ~ 350 Vdc
NG
Check Rectifier Ckt.
OK
Check Q803
NG
Replace Q803
OK
Check D820 ~ D824
NG
Replace D820 ~ D824
OK
Check IC801 #5 ≤ 2.5V?
NG
Check R805
OK
Check IC801 #2 ≈ 2.5V?
NG
Check R816
OK
Replace IC801

Abnormal Vertical Height

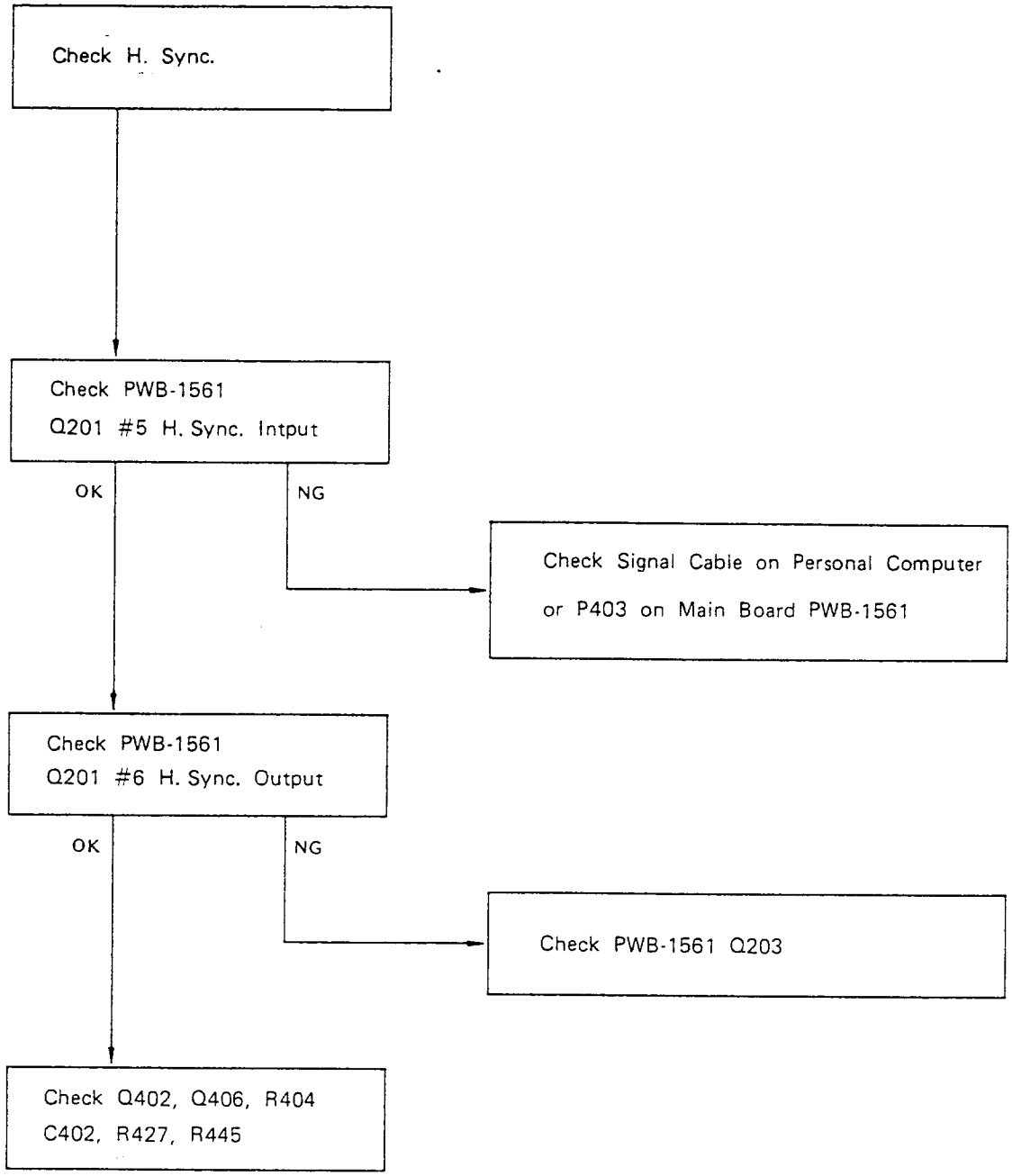


Abnormal Hor Width

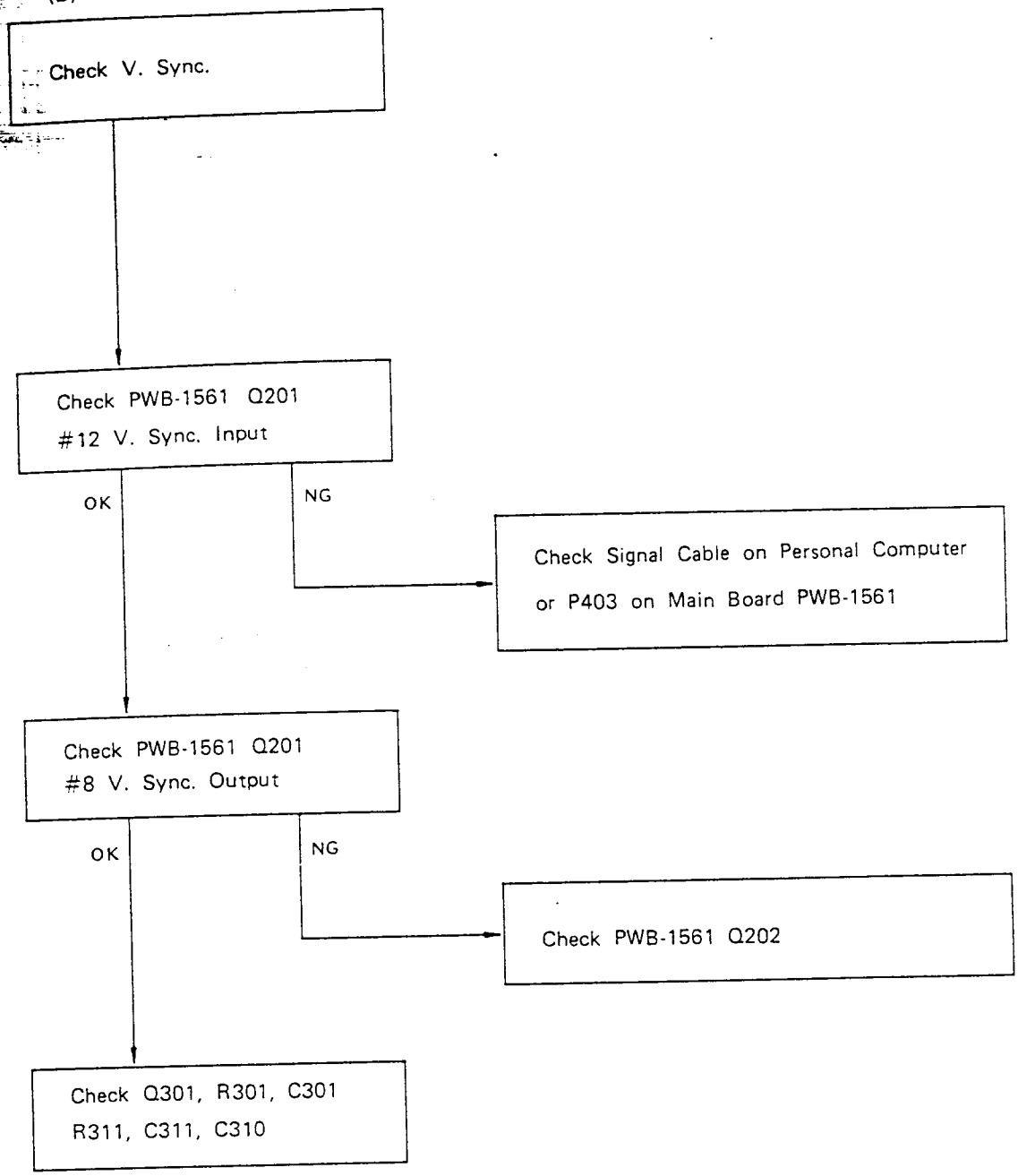


Unstable Synchronization

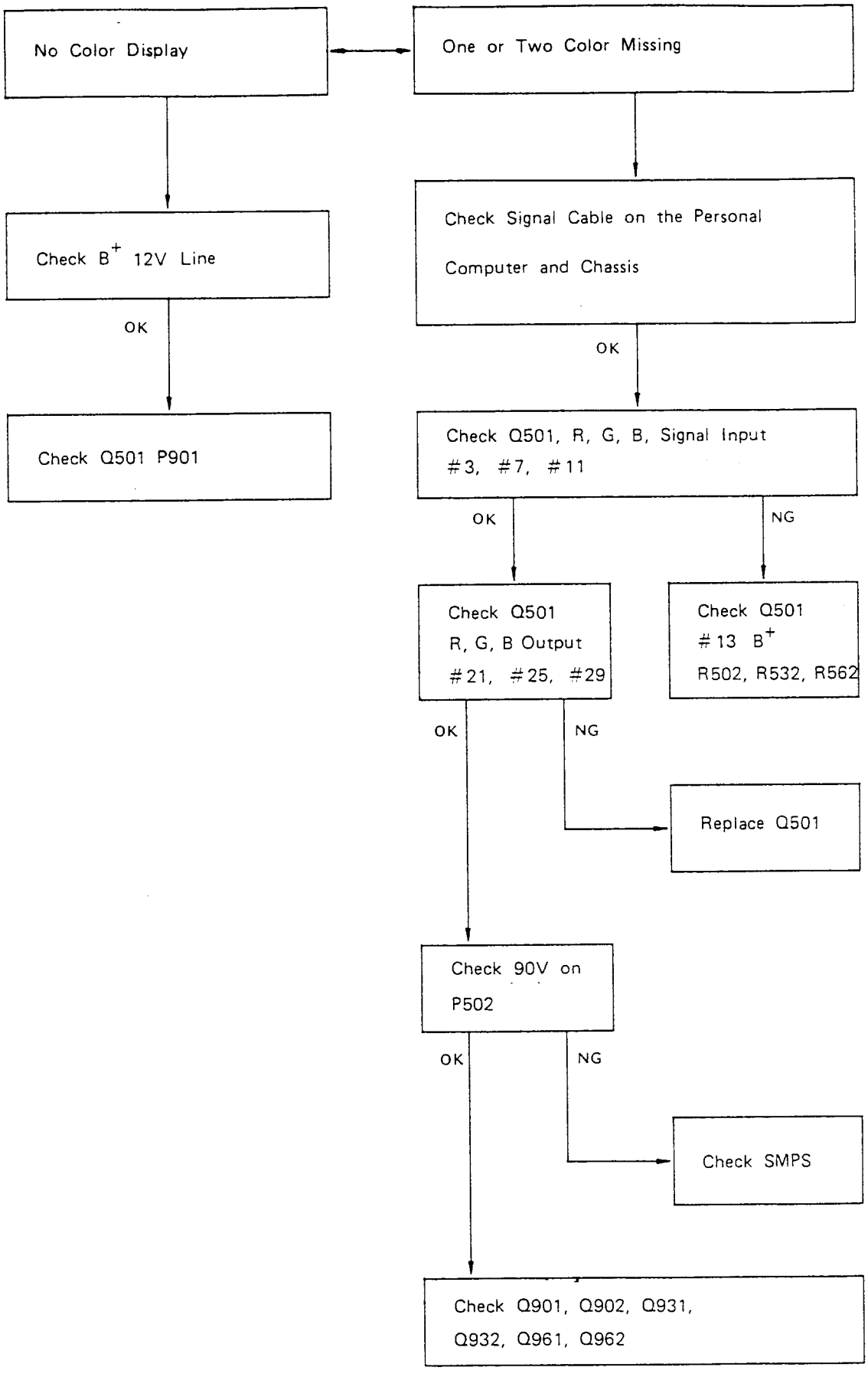
(A) Horizontal sync.



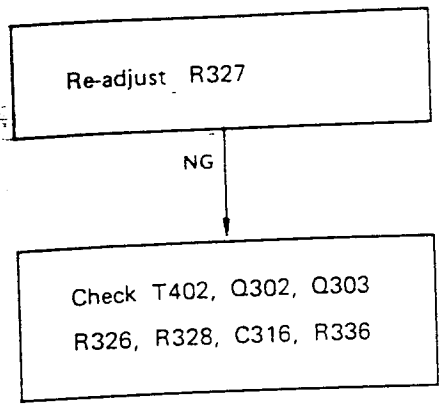
(B) Vertical sync.



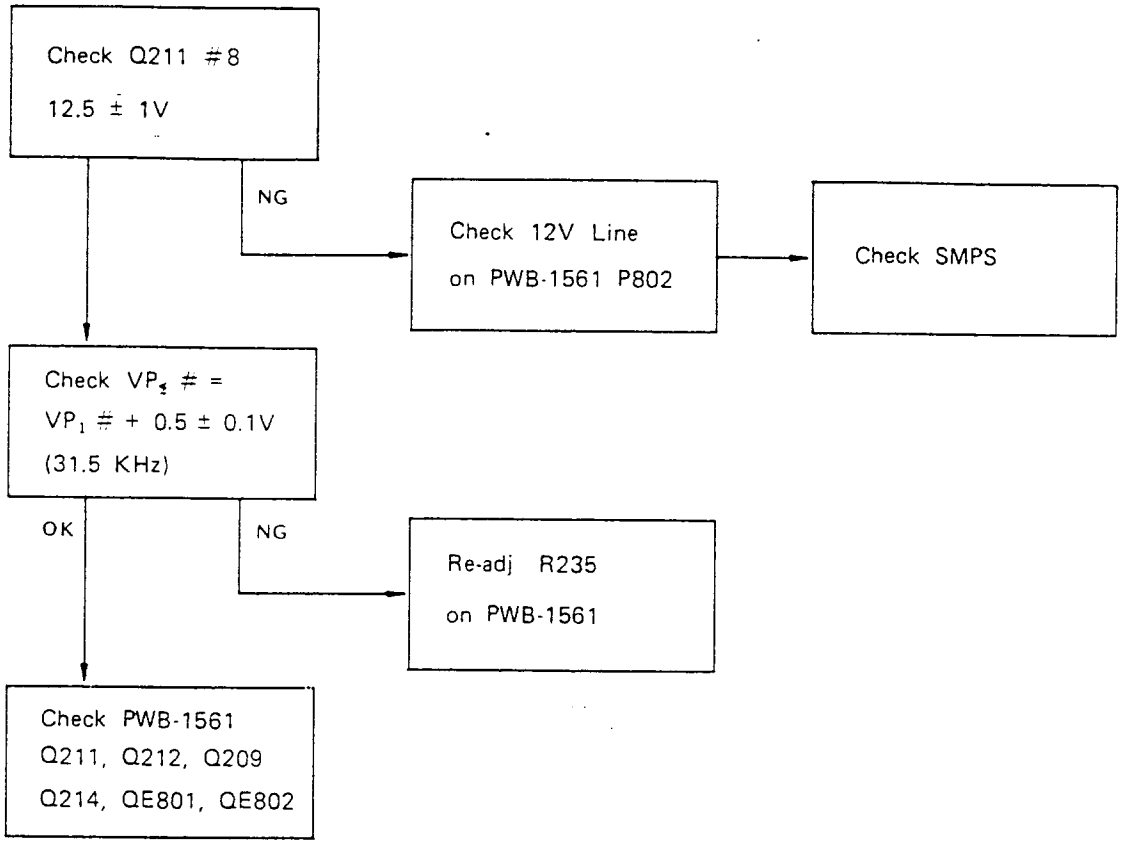
Abnormal Color Display



Abnormal Side Pincushion Distortion

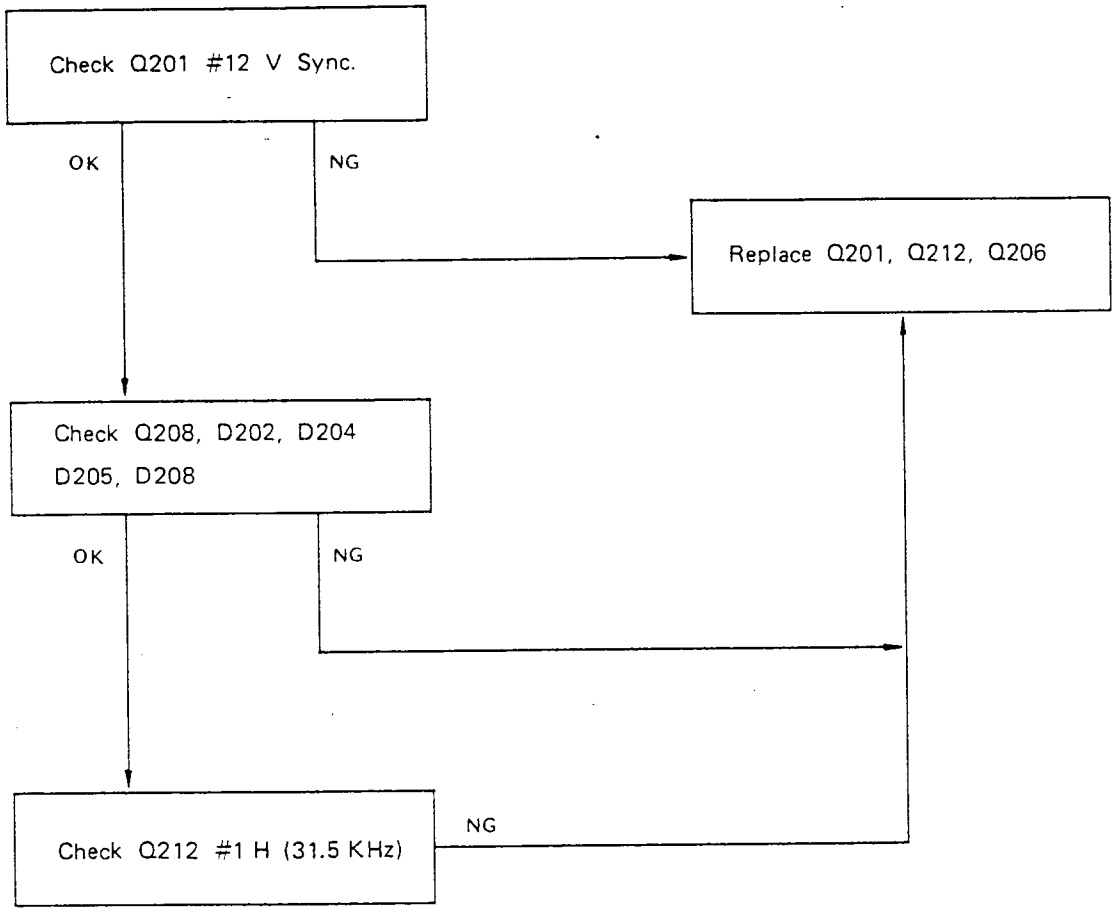


Abnormal 31.5 KHz/35.5 KHz Chage

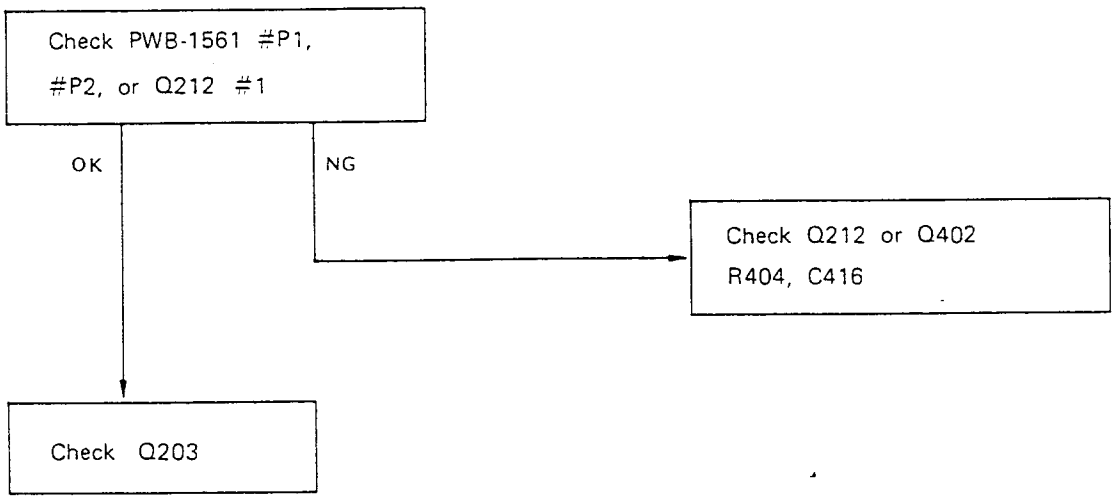


Abnormal Contral Board (PWB-101)

(A) Abnormal MODE 1 ~ MODE 5 Vertical Height



(B) Abnormal 31.5 KHz/35.5 KHz Hor Hold & Hor Phase Change



8.REPLACEMENT PARTS LIST

WARNING: Replacement parts which have special characteristics important to safety should be replaced only with types identical to those in the original circuit or specified in the parts list. Before replacing any of these components, read carefully the product safety precaution, do not degrade the safety of the display through improper servicing.

CKT NO.	PART NO.	DESCRIPTION	SPEC	
		ASSEMBLY,PCB-MAIN, PWB-1561-03		
CAPACITOR				
C201	5222110391	CAPACITOR,POLYESTER	CQ92M	50V10000.00PFJ
C202	5213410191	CAPACITOR,ELECTROLYTIC	CE04W	25V 100.00UFM
C203,C204	5213247091	CAPACITOR,ELECTROLYTIC	CE04W	10V 47.00MFM
C206	5222110491	CAPACITOR,POLYESTER	CQ92M	50V 0.10MFJ
C207	5222115391	CAPACITOR,POLYESTER	CQ92M	50V15000.00PFJ
C210	5213622891	CAPACITOR,ELECTROLYTIC	CE04W	50V 0.22UFM
C211	5221115291	CAPACITOR,POLYESTER	CQ93M	50V 1500.00PFJ
C212	5242210191	CAPACITOR,CERAMIC CC45	CH DC	50V 100.00PFJ
C213,C305	5222110491	CAPACITOR,POLYESTER	CQ92M	50V 0.10MFJ
C306				
C302	5213510213	CAPACITOR,ELECTROLYTIC	CE04W	35V 1000.00UFM
C303	5236310401	CAPACITOR,BARRIER,LAYER,CG45X	F DC	50V 0.10UFZ
C304	5213622112	CAPACITOR,ELECTROLYTIC	CE04W	50V 220.00UMM
C307	5222410401	CAPACITOR,POLYESTER P=7.5MM	CQ92M	100V 0.10UFJ
C308	5213247091	CAPACITOR,ELECTROLYTIC	CE04W	10V 47.00MFM
C309	5213410213	CAPACITOR,ELECTROLYTIC	CE04W	25V 1000.00UFM
C310	5275133401	CAPACITOR,METALLIZED P.E P=5MM	CF93M	63V 0.33MFJ
C311	5222110491	CAPACITOR,POLYESTER	CQ92M	50V 0.10MFJ
C312	5214410012	CAPACITOR,ELECTROLYTIC	CE04W	250V 10.00UFM
C313	5214247991	CAPACITOR,ELECTROLYTIC	CE04W	160V 4.70UFM
C314	5213510091	CAPACTIOR,ELECTROLYTIC	CE04W	35V 10.00UFM
C315	5232710301	CAPACITOR,CERAMIC CK45	E DC	500V10000.00PFP
C316	5213522091	CAPACITOR,ELECTROLYTIC	CE04W	35V 22.00UFM
C317	5213410091	CAPACITOR,ELECTROLYTIC	CE04W	25V 10.00UFM
C318	5213233112	CAPACITOR,ELECTROLYTIC	CE04W	10V 330.00UFM
C319	5247068191	CAPACITOR,CERAMIC CC45	SL DC	50V 680.00PFJ
C320	5213447091	CAPACITOR,ELECTROLYTIC	CE04W	25V 47.00UFM
C323	5213410091	CAPACITOR,ELECTROLYTIC	CE04W	25V 10.00UFM
C401	5213447112	CAPACITOR,ELECTROLYTIC	CE04W	25V 470.00UFM
C402	5227330291	CAPACITOR,POLYPROPYLENE	CQ93T	100V 3000.00PFJ
C403	5221156291	CAPACITOR,POLYESTER	CQ93M	50V 5600.00PFJ
C404	5213601091	CAPACITOR,ELECTROLYTIC	CE04W	50V 1.00UFM
C405,C431	5221110401	CAPACITOR,POLYESTER P=7.5MM	CQ93M	50V 0.10MFJ
C406	5221110391	CAPACITOR,POLYESTER	CQ93M	50V10000.00PFJ
C407	5231310291	CAPACITOR,CERAMIC CK45	B DC	50V 1000.00PFK
C408	5221147291	CAPACITOR,POLYESTER	CQ93M	50V 4700.00PFJ
C409	5247015191	CAPACITOR,CERAMIC CC45	SL DC	50V 150.00PFJ
C410	5221147291	CAPACITOR,POLYESTER	CQ93M	50V 4700.00PFJ
C411	5213322191	CAPACITOR,ELECTROLYTIC	CE04W	16V 220.00UFM

CKT NO.	PART NO.	DESCRIPTION	SPEC
C412	5224422301	CAPACITOR,POLYPROPYLENE P=10MM	CQ93T 250V22000.00PFK
C413	5232310291	CAPACITOR,CERAMIC CK45	B DC 500V 1000.00PFK
C415	5248418100	CAPACITOR,CERAMIC CC45	SL DC 2KV 180.00PFJ
C416	5210502900	CAPACITOR,ELECTROLYTIC NP	CE02W 50V 0.47UFM
C417	5231810391	CAPACITOR,CERAMIC CK45	F DC 50V10000.00PFZ
C418,C419	5223002701	CAPACITOR,POLYPROPYLENE P=15MM	CQ93T 800V15000.00PFJ
C420			
C422	5232310291	CAPACITOR,CERAMIC CK45	B DC 500V 1000.00PFK
C423	5214210012	CAPACITOR,ELECTROLYTIC	CE04W 160V 10.00UFM
C424	5234547201	CAPACITOR,CERAMIC CK45	E DC 2KV 4700.00PFM
C425	5270302501	CAPACITOR,METALLIZED P.P P=15	CF93T 250V 0.22MFJ
C426	5270304501	CAPACITOR,METELLIZED P.P P=15	CF93T 250V 0.33MFJ
C427	5231333291	CAPACITOR,CERAMIC CK45	B DC 50V 3300.00PFK
C431	5236310401	CAPACITOR,BARRIER,LAYER,CG45X	F DC 50V 0.10UFZ
C433	5216347001	CAPACITOR,ELECTROLYTIC (105C)	CE04W 200V 47.00UFM
C437,C441	5222410401	CAPACITOR,POLYESTER P=7.5MM	CQ92M 100V 0.10UFJ
C506	5231847391	CAPACITOR,CERAMIC	50 47n F
C531,C561	5213210191	CAPACITOR,ELECTROLYTIC	10V 10u
C565	5213333112	CAPACITOR,ELECTROLYTIC	16V 330u
C593	5213347091	CAPACITOR,ELECTROLYTIC	16V 47u
C594	5275122401	CAPACITOR,POLYESTER	63V 0.22u 5%
C595	5213347991	CAPACITOR,ELECTROLYTIC	16V 4.7u
RESISTOR			
R201	5142412190	RESISTOR,CARBON FILM	RD S B 1/2W 120.00 J
R202,R205	5142818395	RESISTOR,CARBON FILM	RD S B 1/4W 18.00KJ
R203,R204	5142833195	RESISTOR,CARBON FILM	RD S B 1/4W 330.00 J
R206	5142824295	RESISTOR,CARBON FILM	RD S B 1/4W 2.40KJ
R207,R208	5162163720	RESISTOR,VR PN06FB105AR	F5X5 B 1.00MOHM
R211	5162172810	RESISTOR,VR PN08TB104AR	TM5X5 B 100.00KOHM
R219,R220	5142810295	RESISTOR,CARBON FILM	RD S B 1/4W 1.00KJ
R239,R243			
R221,R228	5142810395	RESISTOR,CARBON FILM	RD S B 1/4W 10.00KJ
R230,R231,R303			
R225	5142882395	RESISTOR,CARBON FILM	RD S B 1/4W 82.00KJ
R226,R232	5142847295	RESISTOR,CARBON FILM	RD S B 1/4W 4.70KJ
R234,R301			
R227	5142839295	RESISTOR,CARBON FILM	1/4W 3.9KOHM
R229	5142812495	RESISTOR,CARBON FILM	RD S B 1/4W 120.00KJ
R233	5142847495	RESISTOR,CARBON FILM	RD S B 1/4W 470.00KJ
R235	5162161720	RESISTOR,VR PN06FB502AR	F5X5 B 5.00KOHM
R236	5142839195	RESISTOR,CARBON FILM	RD S B 1/4W 390.00 J
R237	5142822295	RESISTOR,CARBON FILM	RD S B 1/4W 2.20KJ
R238	5142833195	RESISTOR,CARBON FILM	RD S B 1/4W 330.00 J
R240	5142875395	RESISTOR,CARBON FILM	RD S B 1/4W 75.00KJ
R241	5160806137	RESISTOR,VR RV12TB105HKFR	V012LPHJ-36U-B105
R241A	5142843495	RESISTOR,CARBON FILM	RD S B 1/4W 430.00KJ
R304	5142833495	RESISTOR,CARBON FILM	RD S B 1/4W 330.00KJ
R305,RE804	5142868495	RESISTOR,CARBON FILM	RD S B 1/4W 680.00KJ
R307	5142820295	RESISTOR,CARBON FILM	RD S B 1/4W 2.00KJ
R308	5142812195	RESISTOR,CARBON FILM	RD S B 1/4W 120.00 J
R309	5142822995	RESISTOR,CARBON FILM	RD S B 1/4W 2.20 J
R310	5142851295	RESISTOR,CARBON FILM	RD S B 1/4W 5.10KJ
R312	5142401090	RESISTOR,CARBON FILM	RD S B 1/2W 1.00 J
R315	5162173710	RESISTOR,VR PN08TB105AR	TM5X5 B 1.00MOHM
R316	5162172810	RESISTOR,VR PN08TB104AR	TM5X5 B 100.00KOHM

CKT NO.	PART NO.	DESCRIPTION	SPEC
R317	5130315104	RESISTOR,METAL OXIDE FILM,MINI	RS 08 B 1W 150.00 J
R318	5130310204	RESISTOR,METAL OXIDE FILM,MINI	RS 08 B 1W 1.00KJ
R320	5133222907	RESISTOR,FUSIBLE	RNF 14A 1W 2.20 J
R326	5142430290	RESISTOR,CARBON FILM	RD S B 1/2W 3.00KJ
R327	5162171710	RESISTOR,VR PN08TB502AR	TM5X5 B 5.00KOHM
R328	5162171910	RESISTOR,VR PN08TB103AR	TM5X5 B 10.00KOHM
R329	5142810295	RESISTOR,CARBON FILM	RD S B 1/4W 1.00KJ
R330,R331 R450	5142833395	RESISTOR,CARBON FILM	RD S B 1/4W 33.00KJ
R332	5142847095	RESISTOR,CARBON FILM	RD S B 1/4W 47.00 J
R333,R334 RE806	5142847295	RESISTOR,CARBON FILM	RD S B 1/4W 4.70KJ
R335	5142843295	RESISTOR,CARBON FILM	RD S B 1/4W 4.30KJ
R336	5142412190	RESISTOR,CARBON FILM	RD S B 1/2W 120.00 J
R337	5142415190	RESISTOR,CARBON FILM	RD S B 1/2W 150.00 J
R338	5160806117	VR,RV12TB502HKFR	0.15W B 5.00KOHM
R338A	5130330104	RESISTOR,METAL OXIDE FILM,MINI	RS 08 B 1W 300.00 J
R339,R408	5142810295	RESISTOR,CARBON FILM	RD S B 1/4W 1.00KJ
R340	5142811495	RESISTOR,CARBON FILM	RD S B 1/4W 110.00KJ
R342	5142868295	RESISTOR,CARBON FILM	RD S B 1/4W 6.80KJ
R343	5162162220	RESISTOR,VR PN06FB223AR	F5X5 B 22.00KOHM
R401,R461	5142482190	RESISTOR,CARBON FILM	RD S B 1/2W 820.00 J
R402	5142830295	RESISTOR,CARBON FILM	RD S B 1/4W 3.00KJ
R403	5142824295	RESISTOR,CARBON FILM	RD S B 1/4W 2.40KJ
R404	5142812395	RESISTOR,CARBON FILM	RD S B 1/4W 12.00KJ
R405	5162161720	RESISTOR,VR PN06FB502AR	F5X5 B 5.00KOHM
R406	5142868395	RESISTOR,CARBON FILM	RD S B 1/4W 68.00KJ
R407	5142810395	RESISTOR,CARBON FILM	RD S B 1/4W 10.00KJ
R409,R410 RE803	5142422290	RESISTOR,CARBON FILM	RD S B 1/2W 2.20K
R411	5160807717	RESISTOR,VR RV09FB502EKER	RK09K1130345-TT B5K M
R412	5142810195	RESISTOR,CARBON FILM	RD S B 1/4W 100.00 J
R413,R414	5142412190	RESISTOR,CARBON FILM	RD S B 1/2W 120.00 J
R416	5130468204	RESISTOR,METAL OXIDE FILM,MINI	RS 08 B 2W 6.80KJ
R417	5142433290	RESISTOR,CARBON FILM	RD S B 1/2W 3.30KJ
R420	5130382104	RESISTOR,METAL OXIDE FILM,MINI	RS 08 B 1W 820.00 J
R422	5162161720	RESISTOR,VR PN06FB502AR	F5X5 B 5.00KOHM
R423	5160807717	RESISTOR,VR RV09FB502EKER	RK09K1130345-TT B5K
R427	5142843395	RESISTOR,CARBON FILM	RD S B 1/4W 43.00KJ
R435	5142447090	RESISTOR,CARBON FILM	RD S B 1/2W 47.00 J
R439,R440	5142820295	RESISTOR,CARBON FILM	RD S B 1/4W 2.00KJ
R441	5142816495	RESISTOR,CARBON FILM	RD S B 1/4W 160.00KJ
R442	5142856395	RESISTOR,CARBON FILM	RD S B 1/4W 56.00KJ
R443	5162172810	RESISTOR,VR PN08TB104AR	TM5X5 B 100.00KOHM
R445	5142811395	RESISTOR,CARBON FILM	RD S B 1/4W 11.00KJ
R448	5162907544	RESISTOR,VR PN09FB475DR	0.5W 1000V B 4.70M OHM
R449,R451	5136022595	RESISTOR METAL GLAZE FILM	RS 08 B 1/4W 2.20MJ
R460	5142820395	RESISTOR,CARBON FILM	RD S B 1/4W 20.00KJ
R462	5142851195	RESISTOR,CARBON FILM	RD S B 1/4W 510.00 J
RE805	5130313307	RESISTOR,METAL OXIDE FLIM,MINI	RS 08 B 1W 13.00KJ
RE807	5142818295	RESISTOR,CARBON FILM	RD S B 1/4W 1.80KJ
RE808	5142816295	RESISTOR,CARBON FILM	RD S B 1/4W 1.60KJ
RE810	5160807717	RESISTOR,VR RV09FB502EKER	RK09K1130345-TT B5K M

CKT NO.	PART NO.	DESCRIPTION	SPEC	
SEMICONDUCTORS				
D201,D202	6613001730	DIODE SWITCHING	HIT IS2076 30V 150MA T=26MM	.1
D204.D205				
D208,D308	6613001730	DIODE SWITCHING	HIT IS2076 30V 150MA T=26MM	.1
RA				
D201,D202	6612006030	DIODE DETECTOR	TSB 1S1555-TP3 35V 0.1A T=26MM	
D204,D205,D208,D308 RB				
D210	6615012234	DIODE ZENER	TSB 05AZ5.1Y 4.81V-5.17V T=26MM	
D235 RA	6615010633	DIODE ZENER	TSB 05AZ12X 11.08V-11.67V T=26MM	
D235 RB	6615010635	DIODE ZENER	05A12Z	
D301	6611013242	DIODE RECTIFIER	GIT GP15D 200V 1.5A T=52MM	
D303 RA	6613002245	DIODE SWITCHING	GIT RGP10G 400V 1A F T=52MM	.1
D303 RB	6613002242	DIODE SWITCHING	HIT V09E 400V 1A F T=52MM	
D305	6615007930	DIODE ZENER	HIT HZ11A2 9.7-10.1V T=26MM	
D306,D307	6613003032	DIODE SWITCHING	HIT 1N4148 75V 150MA T=26MM	
D401 RA	6615014130	DIODE ZENER	SYO GZA9.1X 8.6-9V T=52MM	
D405 RA	6613002244	DIODE SWITCHING	GIT RGP10D 200V 1A T=52MM	
D405 RB	6613002243	DIODE SWITCHING	HIT V09C 200V 1A F T=52MM	
DE801	6611013242	DIODE RECTIFIER	GIT GP15D 200V 1.5A T=52MM	
Q201 RA	6646009922	IC,DIGITAL	HIT HD74LS86	
Q201 RB	6646009923	IC DIGITAL	GS GD74LS86 QUAD EOR GATE	
Q203	6645009002	IC, DIGITAL MOS	HIT HD14053BP	
Q208 RA	6646010300	IC DIGITAL	NS DM74LS138 3TO8 DECODER/DEMUL	
Q208 RB	6646010310	IC,DIGITAL	MOT SN74LS138 3TO8 DECODER	
Q209,Q210	6621015332	TR NPN HF	TSB 2SC1815Y TPE2 TAPING	
Q214,Q207				
Q211	6644060100	IC LINEAR	SHP IR9331	
Q212	6644060000	IC LINEAR	NEC UPC4557C	
Q213,Q206	6645009002	IC, DIGITAL MOS	HIT HD14053BP	
Q207				
Q301	6644045200	IC,LINEAR	SGS TDA1670A(GL1211)	
Q303 RA	6623006330	TR PNP HF	TSB 2SA966-Y-TPE6	
Q303 RB	6624007530	TR PNP LF	HIT 2SB739-C TAPING	
Q401 RA	6622013330	TR NPN	2SD667C	
Q401 RB	6622014030	TR NPN LF	HIT 2SD669AC TAPING	
Q402 RA	6644032900	IC,LINEAR	MOT MC1391P HOR.PROCESSOR	
Q402 RB	6644011303	IC LINEAR	NS LM1391N	
Q402 RC	6644011302	IC LINEAR	RCA CA1391E	
Q403	6621028400	TR NPN HF	HIT 2SC3883	
COILS AND TRANSFORMERS				
L401	5062104700	COIL,CHOKE (LINE)	CHK-117 18UHJ	
L402	5062205300	COIL,WIDTH TWH-137	CENTER=80UH	
L403	5062221400	COIL,HOR LINEARITY	TLH-214	
L404	5062110300	COIL CHOKE	CHK-311	
T401	5062412901	TRANS HOR DRIVE TLN-129A	100MH/200UH 22.5/1	
T402	5062802200	TRANS,SIDE PIN CUSHION	TPC-0022 LH=48.5UH	
T403 RA	5062621802	TRANS,FLYBACK COLOR	TFB-218B HV=22.5KV B+=110V	
T403 RB	5062621803	TRANS,FLYBACK,COLOR	TFB-218C (HITACHI)	